31/10/24

Vol. XXII. Part 10.

[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

The Journal of the Department of Agriculture of Victoria, Australia.

October, 1924.

PRINCIPAL CONTENTS

Experiments in Cool Storage of Fruit

Farm Book-keeping

Wheat and Its Cultivation

Some Ampelographical Notes

PRICE THREEPENCE. (Annual Subscription—Victoria, Inter-State, and N.Z., 3/-; British and Foreign, 5/-.)

ROOT CROPS

Are Unequalled for Winter Feed

For Dairy Cows, Store Cattle, Horses and Pigs, being HIGH IN FEEDING VALUE AND RICH IN THE NECESSARY ELEMENTS, both for preserving the flow in Milch Cows, and for putting all classes of Stock into first-class condition.

THE MOST GENERALLY USED AND THE BEST ROOT CROPS ARE:—

SUGAR MANGEL	(6 lb.)	**SUGAR BEET**	(8 lb.)
MANGEL -	(4 lb.)	**SWEDE** -	(2 lb. to 3 lb.)
FIELD CARROT	(4 lb.)	**FIELD TURNIP**	(2 lb. to 3 lb.)

The figures in brackets represent the quantity of either Brunning's or other high-grade seed required to sow an acre in drills.

Brunning's Genuine "Garawi"

SUDAN GRASS

Is the Finest of All The Summer Hay Plants

This wonderful Summer Fodder is extremely drought-resistant, and in this respect it excels Japanese Millet; grows under dry conditions where other plants will not thrive; makes quick growth, and yields up to four cuttings in a season. Can be pastured, cut for green feed, or made into ensilage. **Be sure you get only Brunning's Genuine "Garawi" Strain for Best Results.**

"Standard" Quality

JAPANESE MILLET

Is Machine-Dressed, Graded and Tested;

and represents the finest quality obtainable. This plump, full-bodied seed produces strong, healthy plants, and gives the results in heavy, profitable yields of green feed, pasture, or seed.

Although a shade more expensive in first cost, it is actually the cheapest proposition, as a lesser quantity is required to sow an acre than with lower grade samples.

FURTHER PARTICULARS AND PRICES ON REQUEST

BRUNNINGS

F. H. BRUNNING Pty. Ltd.

64 ELIZABETH STREET, MELBOURNE

THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

NATIONAL MUSEUM MELBOURNE

CONTENTS.—OCTOBER, 1924.

		PAGE
Cool Storage of Fruit—Report on Experiments conducted during 1923 Season	*D. B. Adam, B.Agr.Sc*	577
Farm Book-keeping	*T. Forristal, L.I.C.A.*	591
Wheat and Its Cultivation	*A. E. V. Richardson, M.A., D.Sc.*	600
Old Journals Wanted		614
Some Ampelographical Notes	*F. de Castella*	615
Storing Mangels		623
Poultry Parasites		624
Children and Food Value of Milk		631
Mineral Matter in Cattle Foods	*A. J. Gill*	632
Refrigeration of To-Day as Applied to Fruit	*J. Hepburn*	633
Rhubarb Culture		635
Orchard and Garden Notes		637
Reminders for November		639

COPYRIGHT PROVISIONS AND SUBSCRIPTION RATES.

The Articles in the Journal of the Department of Agriculture of Victoria are protected by the provisions of the Copyright Act. Proprietors of newspapers wishing to republish any matter are at liberty to do so, *provided the Journal and author are both acknowledged.*

The Journal is issued monthly. The subscription, which is payable in advance and includes postage, is 3s. per annum for the Commonwealth and New Zealand, and 5s. for the United Kingdom and Foreign Countries. Single copy, Threepence.

Subscriptions should be forwarded to the Director of Agriculture, Melbourne. A complete list of the various publications issued by the Department of Agriculture will be supplied by the latter.

W. & W. 712

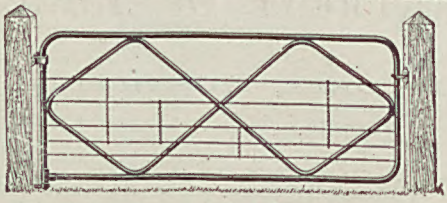
Cyclone

METAL GATES AND FENCES

The Highest Quality is evidenced in every Cyclone Fence or Gate

PERFECTLY BALANCED

SOUNDLY CONSTRUCTED



INSIST ON "CYCLONE"

THE ORIGINAL MAKE

Fig. 215—Cyclone Diamond Paddock Gate for Horses and Cattle. An intensely strong construction. 3 ft. 10 in. high.

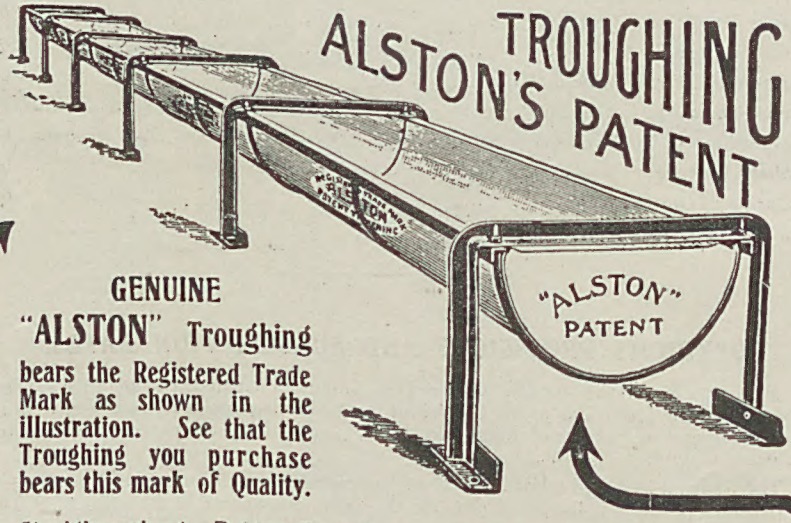
GET NEW CYCLONE CATALOGUE :: 'PHONE CENTRAL 3228 :: MANY STYLES ILLUSTRATED

Cyclone PTY. LTD.

459-461 SWANSTON STREET

MELBOURNE

SYDNEY — AND — ADELAIDE



ALSTON'S PATENT TROUGHING

GENUINE "ALSTON" Troughing bears the Registered Trade Mark as shown in the illustration. See that the Troughing you purchase bears this mark of Quality.

Steel throughout. Put together with a wrench, no solder required. Cannot leak or pull apart, because the Alston Patent Coupling makes a perfectly watertight joint, without grooves to fracture the galvanising, while locking every section together as rigidly as a bridge.

The heavy Steel Angle Frame and heavily Galvanised Steel Sheets used, together with our Patent Coupling, are points which make the "ALSTON" TROUGHING superior to all others.

Send for Illustrated Leaflet.

JAMES ALSTON & SONS PTY. LTD., Queens Bridge, Melbourne.

Postal District 6.

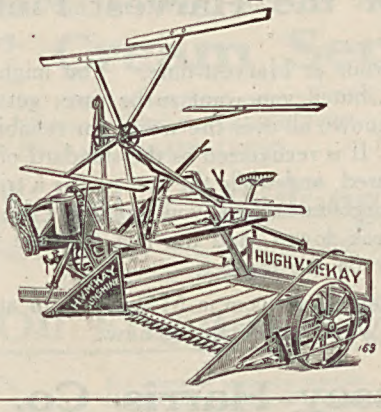
Australian made and specially constructed for Australian conditions.

The Sunshine Reaper and Binder

Practically only Australian steel and timber used.

An exceptionally strong light-running machine.

Will stand up to the severest conditions.

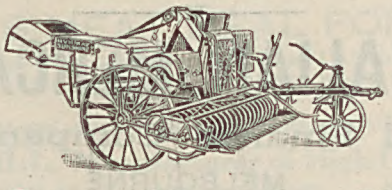


Particular attention has been devoted to the tying device. Specially trained workmen are employed for this important feature, and the result is sure and **perfect tying**

When assembled all machines are put through a running test, as a result of which every machine when it leaves the factory is in perfect running order to straightaway enter the crop. Farmers, owing to this prevision, can actually start the machines themselves without waiting for the expert.

Australia's Premier Harvesting Machine!

Will recover practically all grain even from thistle-infested and tangled crops.



Not hundreds, but thousands, in use, to testify to its excellence.

The Sunshine Header Harvester

A machine of robust construction—Light running—so simple that a boy can work it—Practically no waste—The ideal machine in wheat, oats, and barley—Deservedly the farmer's favorite.

SOLE MANUFACTURERS: H. V. McKAY PTY. LTD.,

Sunshine Harvester Works, Sunshine

PRINCIPAL BRANCHES AND AGENCIES:

102-105 North-terrace, Adelaide.
Stanley-street, South Brisbane.
36 Pier-street, Perth.
664 Bourke-street West, Melbourne.
27-39 George-street West, Sydney.
Cr. York and St. John Streets, Launceston.

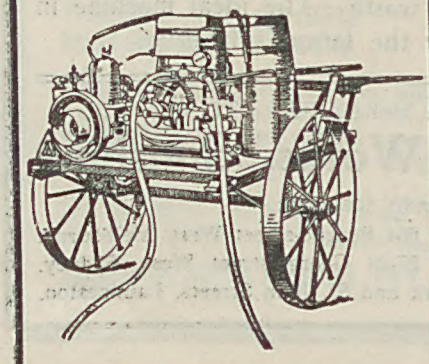
MASSEY-HARRIS
REAPER AND BINDER
The Old Reliable of the Harvest Field

Delays are dangerous at Harvest-time. You might get through with an inferior Binder, but if you want to be sure, get the Massey-Harris Binder, which is known all over the world for reliability under the most trying conditions. It is recognized as the standard of excellence wherever Binders are used, and while the first cost is a trifle more than some others, that is forgotten when you consider the greater efficiency, freedom from break-downs, and the fact that the Massey-Harris will outlast any Binder on the market.

Inspect it at our show-room in Melbourne, or at your local Massey-Harris Agency. Write for Catalogue now.

Massey-Harris Co. Ltd.
570-576 Bourke St., Melbourne
Branches in All States
Agencies Everywhere

FOR TOP PRICES——CONSIGN YOUR
WOOL, GRAIN, PRODUCE, FAT STOCK
——TO——
AUSTRALIAN, MERCANTILE,
Land and Finance Company Limited
MELBOURNE
Sales of Sheep and Cattle held Weekly at Newmarket



Spraying Machinery
FOR ALL PURPOSES
Orchard, Vineyard, Station and Farm

RUSSELL & CO.
MANUFACTURERS
BOX HILL —— MELBOURNE

TO ATTAIN
SUCCESS IN DAIRYING

Your Motto should be Keep Good Cows and install efficient, reliable, and labour saving Dairy Machinery.

THERE IS NOTHING BETTER THAN

"Baltic" Cream Separators

World-renowned for clean skimming, easy running, and durability.
SEVERAL SIZES TO CHOOSE FROM.
REASONABLE PRICES. EASY TERMS. 30 DAYS' TRIAL.

Sanitary "Simplex" Milking Machines

They embody the very best scientific and successful methods for milking cows.

"Baltic" Oil Engines

ECONOMICAL. EFFICIENT.
Start instantly without trouble.

WRITE FOR FREE ILLUSTRATED CATALOGUE

For Separator Catalogue mention No. S 200
For Milking Machine Catalogue mention No. M 200
For Engine Catalogue mention No. E 200

BALTIC SIMPLEX MACHINERY CO. Pty. Ltd.
491-493 FLINDERS LANE, MELBOURNE.

COCKBILL'S
HIGH-GRADE BLOOD AND BONE MANURE

HIGHEST ANALYSIS IMMEDIATE RESULTS

COCKBILL'S MEAT MEAL FOR POULTRY

Fills the Egg Basket **Price, 16/- per cwt.**
Poultry Bone Grit, 15/- per cwt. **Cattle Bone Lick, 16/- per cwt.**

Prices and Analyses of Manures on application to

J. COCKBILL, Manufacturer of High-Grade Manures
407 POST OFFICE PLACE, MELBOURNE **Telephone 2098**
BONES BOUGHT CONSIGN TO J. COCKBILL, FOOTSCRAY

BLYTH'S TRADE MARK WILL NOT BURN BLUE BELL BRAND FOLIAGE REGISTERED ARSENATE OF LEAD

15 Years Practical Tests

The Renowned

"BLUE BELL"
Arsenate of Lead

Secure your orders at once.

F. W. PRELL & CO., 31 Queen St., Melbourne
SOLE VICTORIAN AGENTS

SUPERPHOSPHATE for WHEAT

PROFIT BY EXPERIENCE OF OTHERS

Increased Dressings per acre insure
MORE WHEAT
BIGGER BANK BALANCES
MORE FEED IN STUBBLES

TOP-DRESSED PASTURES

DOUBLE THE CARRYING CAPACITY
IMPROVE THE HEALTH OF THE STOCK
INCREASE THE FLOW OF MILK

Mount Lyell Chemical Works

381 LITTLE COLLINS STREET, MELBOURNE, VIC.
Works—Yarraville, Vic.

Friesian Stud Farm,
Burnbank, Berwick, Vic.

Queensland Molasses Co.

Dear Sir,—I have used large quantities of "Mollerne" through the Winter and have good results in milk returns. We feed it in a mixture of Hay Chaff with some concentrates, and have had the highest yield of milk yet produced on the farm—up to 9¼ gallons per cow. I can recommend the use of "Mollerne" to Dairymen as a cattle food well worthy of a trial, and once used will be continued.

Yours faithfully,
(Sgd.) FLACK & SEWELL,
per W. Gamble,
Managing Partner.

SUGAR CANE MOLASSES

For STOCK, in 40-Gallon Casks and 4-Gallon Tins

"MOLLERNE" (Pure Sugar Cane Molasses and Lucerne Chaff)

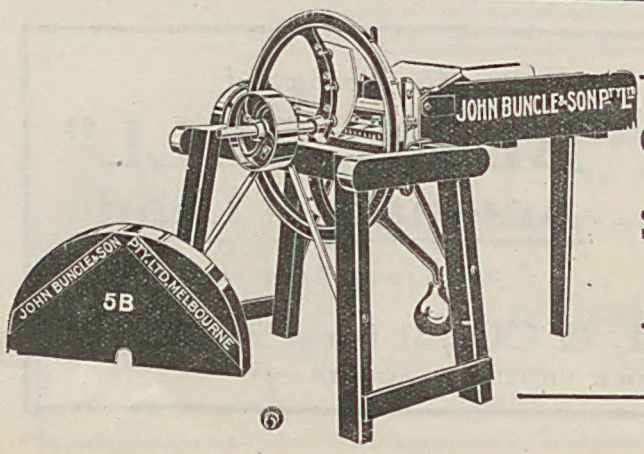
Patent Food for all Classes of Stock and Poultry

Highest in Protein and Carbohydrates

Sold in 100-lb. Bran Bags, ready for the Feed Box

Samples and prices from— *USE IT LIKE BRAN*

Queensland Molasses Coy., Melbourne



No. 5B

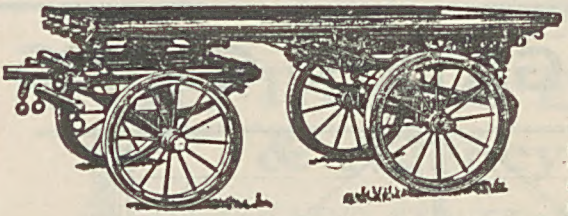
CHAFF CUTTER

£21 on terms.

Chaffcutters, Corncrushers, Root Pulpers, Sawbenches, Horse Works, Belting.

Write for Illustrated Catalog.

JOHN BUNCLE & SON
—PTY. LTD.—
NORTH MELBOURNE



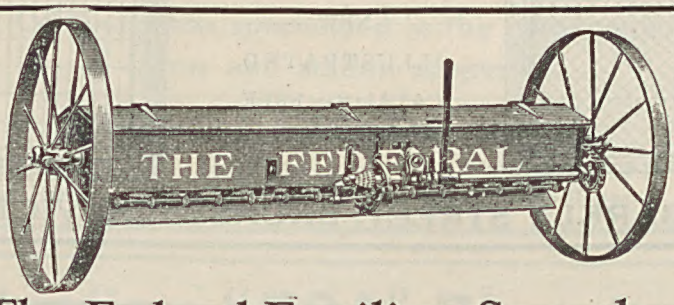
"Australia's Wagon"

Hildyard Steel Wheel Wagons at the Front. They are now fitted with **twin roller bearings**, 33 per cent. saved in draft. More **durable** than ever. **Less wear and tear.** No boxes to crack. We **guarantee** them. The **rollers** run in oil in dustproof races. They are now perfection, and we can supply to carry all weights as usual for **wool, wheat,** or **farm.** Ordinary axles supplied if preferred.

J. J. Gordon (Ardlethan) says:—"The 5 ton, 36 in. and 40 in. dia. wheel wagon you supplied me runs splendid. I am putting 60 bags of wheat on 2 horses. That proves its light draught."

Send for Catalog Now **HILDYARD WAGON WORKS,** **KENSINGTON, MELBOURNE, VIC.**

TOP-DRESSING IS PROFITABLE



The Federal Fertilizer Spreader

FOR

Enriching Pasture Lands to Increase the Stock Carrying Capacity

This Machine sows from 30 lbs. to 500 lbs. per acre. Provided with star feeds—cannot clog—sowing quantities easily and quickly changed.

A One-Horse Machine, and a Boy can operate it.

T. ROBINSON & Co. Pty. Ltd. Patentees and Manufacturers

Factory: Spottiswood, Vic. Show Rooms: Bourke St. Write for Catalogue.

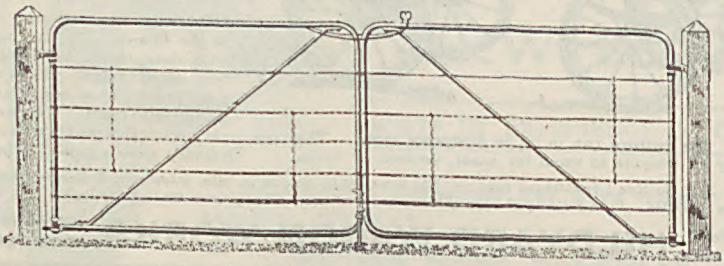
LYSAGHT'S

— ORB —

CORRUGATED ROOFING IRON

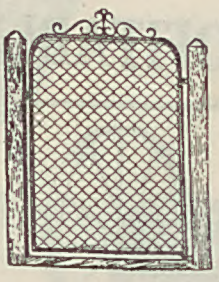
Full supplies throughout Australia are obtainable from all leading Ironmongers and Timber Merchants

GATES GATES GATES

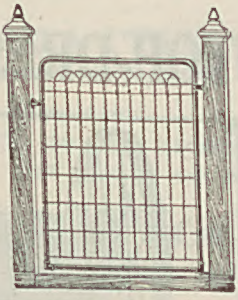


—— Manufactured by - ——

T. N. CHUCK Wire Fence & Gate Co. Pty. Ltd.



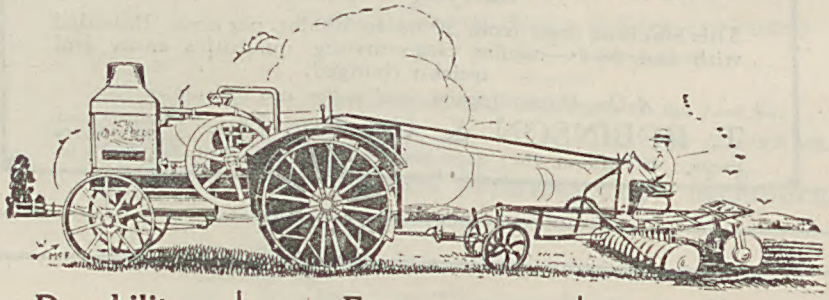
SEND FOR OUR
—— NEW ——
ILLUSTRATED
CATALOG. FREE



24 BARKLY STREET, BRUNSWICK, VICTORIA

Rumely Oil Pull Tractors

Make Power Farming Profitable



Durability

1. Accessibility and ease of adjustment.

2. Has the slowest speed heavy duty engine of any tractor on the market—560 r.p.m.

3. Engine oil cooled, prevents overheating, and requires less attention.

4. Dual lubrication system.

Many other features not embodied in other tractors.

Economy.

For the past ten years Oil Pull Tractors have held the world's record in fuel economy, using kerosene in the motor. Oil Pull Tractors established the world's lowest fuel consumption records at Winnipeg, Canada, 1922; Ohio State University test, Columbus, Ohio, 1920 Purdue University test, La Fayette, Inda, 1921; 38 per cent. less than the average fuel consumption of 65 representative tractors tested by the Nebraska State test, 1920. Full particulars of above tests supplied on request.

Service.

For Ten Years, in hot weather and under Australian conditions, Oil Pull has delivered drawbar and belt service with unfailing regularity. The First RUMELY OIL PULL Tractors sold in Australia, 1913, still working satisfactorily. This long life means small yearly depreciation, lower cost per year of service, economy in the strictest sense of the word.

For further details regarding Oil Pull Tractors write—

J. BARTRAM & SON PTY. LTD. 586 BOURKE STREET —— MELBOURNE ——

ESTABLISHED 1878

THE Trustees Executors & Agency Co. Ltd.

OF 412 COLLINS STREET, MELBOURNE

Directors:

Sir John Grice, Chairman.
Sir J. H. MacFarland, M.A., LL.D., Vice-Chairman.
Harry Emmerton R. O. Blackwood D. Stuart Murray

Authorized by Special Acts of Parliament to act as Trustee, Executor, Administrator, and in other trust capacities.

The Company has specialized in the management of farms and station properties

Please call or write for explanatory booklet.

JAS. BORROWMAN, General Manager. FREDK. A. LANG, Manager. C. R. SMIBERT, F.I.C.A., Sub-Manager.

Australian "ESA" Bluestone

Approximate Analysis 99·15% Copper Sulphate.

FOR SPRAYING, PICKLING, BATTERY PURPOSES, ETC.

If your Storekeeper has no Stocks, Send your Inquiries to:—

ELDER, SMITH & CO., LIMITED, SOLE AGENTS

ADELAIDE: 27-31 Currie Street. MELBOURNE: 95-97 William Street. SYDNEY: 4 Bridge Street.
BRISBANE: 334-338 Queen Street. PERTH: St. George's Terrace.

—— WRITE FOR DESCRIPTIVE PAMPHLET ——

Scientifically Fitted Glasses

Correct Eyestrain

Allowing your eyesight to go in a poor condition only means that you will regret the incident in future years. Call to-day and have your eyes thoroughly examined.

'Phone 6778 for an appointment.

E. WOOD PTY. LTD. Certified Ophthalmic Opticians 95 Elizabeth St., Melbourne

New Zealand Loan & Mercantile Agency Co. Ltd.

COLLINS STREET, MELBOURNE

LIBERAL CASH ADVANCES

WOOL, GRAIN, SKINS, HIDES, TALLOW, BARK, STOCK AND STATION AGENTS ON COMMISSION ONLY

LOCAL SALES AND SHIPMENTS OF BUTTER UNDERTAKEN ON OWNER'S ACCOUNT

Agents for

PAGE'S WIRE STRAINERS IRONSIDE WIRE CUTTERS
BAILEY'S ANTI-MAMMITIS LOTION
FATERINE, A NATURAL CALF AND PIG FOOD

COOPER'S SHEEP DIP

COOPER'S MILK OIL FLUID COOPER'S WORM TABLETS
WEEDICIDE MEDICO COOPER'S LAVENE

SALES OF SHEEP & CATTLE

Held Weekly at Newmarket

London and North-Eastern Railway, England

THE : : : PORT OF **HULL**

On East Coast of England, adjoining the Great Manufacturing Centres

PROVIDES EVERY FACILITY FOR THE RAPID HANDLING

OF **WOOL**	2 large Docks, specially equipped. Extensive Warehouses. Electrical Machinery. 11 acres of Sheds for Exhibition of Wool where Sales are held.
FRUIT	Expeditiously handled. Fruit Markets on the Docks. Sale Rooms in close proximity. Special storage accommodation.
FROZEN MEAT	Up-to-date Equipment ensures prompt discharge. Cold stores to hold 345,000 carcasses.
AND **GRAIN**	Grain Silo with 40,000 tons capacity. Direct discharge by modern electrical appliances. Warehouses in addition to hold 300,000 qrs. of grain.

EXPRESS RAIL CONNECTIONS WITH ALL PARTS OF GREAT BRITAIN

For further particulars apply:—

AUSTIN WILSON, 476 Collins Street, MELBOURNE

CHIEF REPRESENTATIVE IN AUSTRALIA.

Forty-five years ago

Australian Horticulturists placed a high value on

SULPHATE OF AMMONIA

With the passage of the years its popularity has widened, and it is now regarded as the ideal source of the supply of nitrogen to all farm and orchard crops

Literature gratis from—

The Metropolitan Gas Co.
196 Flinders Street,
MELBOURNE.

FARMERS & GRAZIERS

NATURE helps those who help THEMSELVES
FALLOW your land and RETAIN the MOISTURE
HEAVIER DRESSINGS of NATURE'S Plant Food

"FEDERAL" SUPERPHOSPHATE

Will Increase your Wheat Yield

Grass Lands TOP-DRESSED with "FEDERAL" SUPERPHOSPHATE yield more WOOL, a greater percentage of well-nourished LAMBS, and Increased Quantities of MILK

Particulars supplied by

The Australian Explosives & Chemical Co. Ltd.

(FEDERAL MANURE CO.)

370 LITTLE COLLINS STREET, MELBOURNE

'Phone: Central 4795 (two lines) **Works: Deer Park, Victoria**

REGISTERED TRADE MARK

Works—
CURDIE'S RIVER

Telephone—Central 2807

"BULLDOG" Unburnt (Ground Carbonate) Agricultural Lime

For Orchards, Crops, and Pastures

Its use is strongly recommended by all experts, and those who have had practical experience. Any quantity supplied at shortest notice.

For applying to land we recommend our "Ajax" Lime Spreader

Have you seen our Reinforced Cement Cattle and Pig Troughs?

Rates and full particulars from Distributors—

T. CURPHEY Pty. Ltd. 225 Coppin St. Richmond, Victoria

BURNT LILYDALE LIME

FOR THE LAND

Farmers who have not used **Burnt Lime** should try it. The action of Burnt Lime on the land is **Immediate.** The demand for Building Lime having slackened owing to the War, Farmers have the opportunity of getting a supply of the **well-known Lilydale Lime.**

ANALYSIS go as high as 98% Calcium Oxide.

Apply—

DAVID MITCHELL ESTATE, Sole Proprietors, **OLIVER'S LANE, MELBOURNE**

Works—Cave Hill, Lilydale, Tel. Lilydale 4. **Tel. Central 5726.**

NATIONAL TRUSTEES

Executors & Agency Company of Australasia Ltd.

DIRECTORS:

HON. WALTER MADDEN, Chairman and Managing Director.
EDWARD FITZGERALD, Esq., LL.D. HENRY MADDEN, Esq.
Senator Brigadier-General H. E. ELLIOTT, C.B., C.M.G., D.S.O., D.C.M.
H. V. McKAY, Esq., C.B.E. GERALD P. NEWMAN, Esq.

This Company Acts as Executor or Joint Executor of Wills, Administrator, Trustee of Settlements, and Agent for Absentees under Power of Attorney.

MONEY TO LEND ON BROAD ACRES AND FARM LANDS

Offices—113 Queen St. (Corner of Little Collins-st.), Melbourne

J. H. MACOBOY, Assistant Manager. *HON. WALTER MADDEN, Managing Director.*

Is a simple arrangement that multiplies the power at the handle 260 times—handy to use, easy to move, quickly rigged, and works in roughest country. Standard equipment pulls trees and stumps from 1½ acres without changing anchor. Many other time and labour saving features. Catalogue with pleasure.

TREWHELLA BROS. Pty. Ltd., TRENTHAM

Show Grounds Address—91 Smith Street.

Farmers! Consider these Three Advantages

OF USING

FLORIDA SUPER. 22%

1. 25 cwt. Super. 18% @ £4 10/- per ton, costing	£5	12	6
Contains only as much Phosphoric Acid as 1 ton Florida Super. 22% at £5 per ton, costing	5	0	0
Saving by using Florida Super. 22%	0	12	6
2. Further Saving in Freight for say 200 Miles -	0	1	11
Total Saving per ton of 22% Florida Super.	**0**	**14**	**5**

3. Less Cartage, Handling & Labor to and on farm.

.. MADE BY ..

CUMING SMITH & CO. PTY. LTD.

Head Office: 65 WILLIAM STREET, MELBOURNE

AGENTS EVERYWHERE

AUSTRALIAN MADE WIRE NETTING
PROOF
SYDNEY. N.S.W.
TRADE MARK

LYSAGHT'S

Australian Made

QUALITY GUARANTEED

WIRE NETTING
FENCING WIRE and other WIRE
ZINC OXIDE

Obtainable from all the Leading Merchants and Storekeepers

LYSAGHT BROS. & CO. LTD.

Manufacturers ——— SYDNEY

Victorian Agents—Gibbs, Bright & Co., 34 Queen St., Melbourne

AUDREY'S LORD TWYLISH

The "Banyule" Jersey Stud

Heidelberg, Victoria——8 miles from G.P.O.

ALL GOVERNMENT TESTED
YOUNG STOCK FOR SALE

Inspection and Correspondence Welcomed.

C. GORDON LYON

This Journal

offers exceptional advantages

for Advertising

Circulates throughout the **Country Districts** of **Victoria** and amongst **Farmers** of the **Commonwealth**, reaching also country professional men, tradesmen, schoolmasters, teachers, and the like.

Exceptionally satisfactory results have followed the advertising of Stud Stock in this Journal.

Rates on application to the Official Canvasser

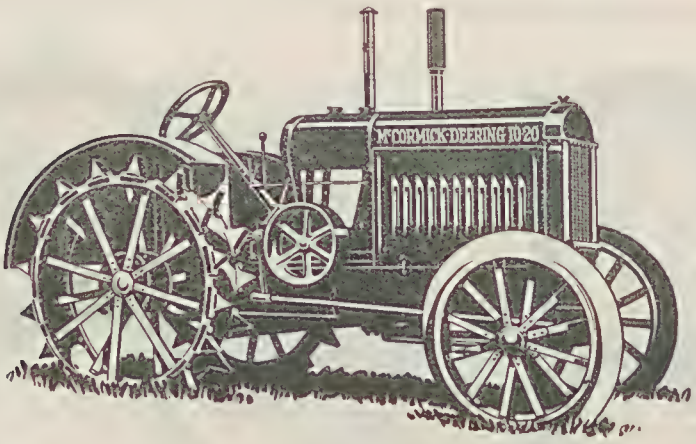
Mrs. Hemming, 38 Seymour Avenue, Malvern

Shell PRODUCTS ON AUSTRALIAN FARMS

"SHELL" MOTOR SPIRIT	—the only motor spirit sold in Australia with a world-wide reputation.
"SHELL" AGRICULTURAL OILS	specially graded and tested for lubricating all types of farm machinery.
"CROSS" POWER KEROSENE	for tractors and oil-engines. The only all-British power kerosene sold in Australia.
"PENNANT" KEROSENE	for lighting, cooking and heating—entirely free from smoke and smell.

THE BRITISH IMPERIAL OIL COMPANY LIMITED

ALL STATES AND NEW ZEALAND



McCORMICK-DEERING TRACTORS

By investment in a McCormick-Deering Tractor you put yourself in much surer control of your seasonal problems. You have liberal power instantly ready when you want it and as long as you need it. Peak-load anxieties mean less to you. Labour is better satisfied to work for you. Your fuel costs are low. Acres that once did nothing but feed horses now raise crops for profit. ¶ With a McCormick-Deering Tractor you have economical and reliable power which cuts the time of your field operations in half, or better, handles more profitably than ever before your draw-bar work, such as plowing, tilling, seeding, harvesting, hauling, etc., and in addition to this, it gives you satisfactory power for all kinds of belt work. Two sizes: 10-20 and 15-30. Write for Catalogue.

International Harvester Company of Australia Pty. Ltd.

543-555 Bourke Street, Melbourne

Agents Everywhere

THE JOURNAL

OF THE

Department of Agriculture

OF

VICTORIA.

Vol. XXII. October, 1924. Part 10.

NATIONAL MUSEUM MELBOURNE

COOL STORAGE OF FRUIT.

Report on Experiments Conducted during 1923 Season.

By D. B. Adam, B. Agr. Sc., Department of Agriculture.

Last year some details were given as to the layout of the experimental chambers, the system of refrigeration employed, the method of ascertaining the variables, temperature and humidity (*Journal of Agriculture*, March, 1923), so that these need no further treatment here.

Further, the method adopted in analyzing the results last year, whereby the factors which affect or limit the "storage life" of the fruit were considered individually in their relation to cool storage conditions, will still be used. (See *Journal of Agriculture*, March, April, and June, 1923.)

In a general way it is felt that these results do confirm the previous year's experience, though some particular deductions made then must be modified.

PEARS.

The physiological change described as "blackening" of skin in Keiffer pears was again studied in regard to its relative rate of appearance at different storage temperatures.

Table I. shows the development of blackening and of mould decay in pears at two different temperatures. A case having been stored at each temperature, the results are expressed as a percentage. This method of expression is also adopted in subsequent tables. The results were obtained after eight months' storage.

TABLE I.

	32°F.	34°F.
Sound	.. 88 ..	75
"Black" ..	.. 5 ..	8
Mould Decay ..	.. 7 ..	16

These results show that both blackening and mould decay are more serious at 34° F. than at 32° F., though the difference in respect to blackening is a small and in itself an insignificant one.

Last season it was noted that the less mature pears remained free from "blackening" better than did the fully mature fruit, and this was made the subject of a tentative recommendation. (*Journal of Agriculture*, March, 1923.) The results expressed in Table II. reflect further information on this point.

Table II. shows the development of "blackening" and of mould on Keiffer pears picked at different stages of maturity. Each case lot was stored under the Direct Expansion system at 34° F., and all were finally examined on the same day, after up to eight months' storage. Each lot was stored one day after picking.

Table II.

	16.2.23.	2.3.23.	24.3.23.
Sound ..	75	91	68
"Black"	8	7	23
Mould Decay	16	2	9

The pears in each of these lots were fully grown, and their actual maturity differences are hard to define. The seed coats of fruit stored on the 16th February, 1923, were light brown, whereas those of fruit stored on the 24th March were quite dark. The "skin" of fruit picked on the 24th March was still a light green, and free from yellow; the earlier picked fruit was proportionally greener.

"Blackening," too, varies in the degree in which it affects each fruit; sometimes the whole surface is blackened, while at other times only a small portion is. Although the figures above refer to any "blackening" whatever, it was found that the severity of attack of individuals in a case was generally in proportion to the numbers affected in the case. No direct evidence has been obtained yet that arbutin actually does exist in the surface cells of Keiffer pears, though the indirect tests and evidence mentioned in the last report have been confirmed. Its isolation is still contemplated, and is the subject of experiment.

APPLES.

Further experiments have been conducted on Scald disease of apples.

The first series of results refer to Jonathan apples grown at Drouin. Two case lots were received at two different times, viz., the 22nd March and the 17th April, 1923. The time between the reception of the apples and their despatch was about two days. Apples in the former consignment were full grown, were "well coloured," but the ground colour was a fairly vivid green. Many apples in this stage of maturity are stored each year, sometimes with unfortunate results. The apples in the second consignment were picked from the same trees as the former lot. The red colour was about the same in degree as that of the first lot, but the ground colour had lost its vividness, though it was not yellow. With the exception of the fact that the weather, both for a long time before the first picking and between the pickings, was very dry, the growing conditions were normal.

Table III. gives the results of the examination of these apples after their being stored at two different temperatures. The apples were all examined on the 27th July, 1923; they had been removed a few days earlier from the store in order to allow them to develop fully the symptoms of scald, should they be affected. The fruit was wrapped in the ordinary wrapping papers. Besides the two cases mentioned above, which were stored at 34° F. in a Direct Expansion chamber, a third case, picked on the 30th March, was stored in a well ventilated position in a Direct Expansion air chamber at 34° F. The results in regard to this fruit are also included in Table III.

Table III.

Condition.	Slight Scald.	Medium Scald.	Bad Scald.	Total Scald.	Sound *i.e.*, not scalded.
A.					
Stored at 32° F.					
(1) Picked 20th March, 1923 ..	22	20	43	85	15
(2) Picked 15th April, 1923 ..	2	1	0	3	97
B.					
Stored at 36° F					
(1) Picked 20th March, 1923 ..	15	5	2	22	78
(2) Picked 15th April, 1923 ..	1	0	0	1	99
(3) Picked 20th April, 1923 (ventilated)	12	3	2	17	83

The cases each contained about 120 apples.

Table IV. refers to Stone Pippin apples, which were grown at Somerville, in the Mornington district. The fruit was examined after seven months' storage, the results being presented similarly to those in Table III. The fruit was stored at 34° F., and was not wrapped.

	Scald.	Sound.
Picked 18th April, 1923	38 ..	62
Picked 2nd May, 1923	3 ..	97

Scald injury is not so clearly defined on Stone Pippins as it is on the Jonathan. The depression produced in the hard variety is very slight, and the boundaries of the injuries are not so clear cut or as well defined as with the Jonathan. This difficulty may have affected the actual accuracy of the figures above, but there is no doubt as to their general bearing.

Both these tables illustrate well the importance of studying the maturity of apples where scald is an important factor in storage. The avoidance of too early picking appears to be an important method of scald prevention.

The limited depressing effect of favorable storage conditions on scald incidence is well shown in Table III. B.

In some seasons and in some localities for various reasons, apples must be plucked at an earlier stage of maturity than the desirable one indicated above, or even if picked at this stage are susceptible to scald. In such cases the use of oiled wrappers seems to be an advantage.

Table V. refers to Buncombe apples which were grown at Harcourt. This variety of apple will store well, keeping free from scald for four months, but after this time rapidly develops scald. The variety is a highly coloured one, and the scald injury is different in appearance

from that on the Jonathan. However, the injury seems to be governed by similar factors, and to be due to similar causes. The fruit was received on the 8th May, 1923, and examined on the 7th November, six months later. The fruit was stored at 32° F. The figures are given as a percentage for comparative purposes.

TABLE V.

	Oil Wrappers.	Unwrapped.
Bad scald	3 ..	10
Slight to medium scald	6 ..	52
Total scald	9 ..	62
Sound	81 ..	30
Mould	10 ..	8

Table VI. covers the results of the examination of case lots of Stone Pippins, Rymers, and Winter Majetins respectively. The fruit in one case of each of the apples was wrapped in oiled papers, in the second case of Winter Majetins sulphite tissue wrappers were used, while the check Stone Pippins and Rymers were naked. The storage temperature of the Stone Pippins was 34° F., of the Rymers and Winter Majetins 36° F. The table shows percentage of scalded and non-scalded apples.

TABLE VI.

	Oiled Wrappers.			Tissue Wrapped.		Unwrapped.
	a	b	c	a	b	c
Scald	0	9	0 ..	34	33 ..	30
Non scald ..	100	91	100 ..	66	67 ..	70

(*a*) Rymers. (*b*) Winter Majetins. (*c*) Stone Pippins.

The results quoted in both Tables V. and VI. demonstrate the efficacy of oiled wrappers as a scald preventive in these varieties. It is well to remember that these results were obtained with apples which from their maturity at the time of picking were suspected to be susceptible to scald. Other experiments with mature Jonathans were inconclusive, since the check case did not develop any scald.

The conclusions reached last year in this matter have received some confirmation, and further suggest that the theory first formulated by Brooks, Cooley, and Fisher* is possibly a correct one, viz., that the injury is due to the action of a volatile substance produced by the apple itself. This substance is capable of being absorbed by mineral oils, and probably is an ester by chemical nature. It seems that this substance is produced in different proportions in different varieties of apples and under different conditions of maturity. If so, *a priori*, immature apples produce greater quantities of the injurious substance than mature apples.

Jonathan Spot.

The history of this disease was given in the last report written on this subject. (See *Journal of Agriculture*, April, 1923). The main result found then was that Jonathan spot primarily affected too mature apples. Jonathan spot and scald rarely occur together in the one case of apples. It was seen in Table III. that apples picked on the 20th March, 1923, and stored at 34° F. showed 22 per cent. of scald, whereas those picked on the 15th April had only 1 per cent. of scald. Subsequent examinations showed that of the sound, non-scalded apples none

* Apple Scald—Jour. Agr. Res., Vol. XVI., No. 8, p. 105.

of those picked on the 22nd March had Jonathan spot, whereas 6 per cent. of the later picked apples were affected. Oiled wrappers do not affect the incidence of this spot in apple in a consistent manner. No useful purpose would be served in presenting results obtained here.

Internal Breakdown.

In last season's report, when considering this cool storage condition, this disease was described as being of two types. In one type the cells composing the flesh were relatively easily separable, and the apples were mealy—these are the "punky" or sleepy apples of the commercial storeman. In the second type, the apples remain firm, the flesh turns brown, is relatively juicy, but individual cells are not distinguishable.

Justification for this arbitrary distinction is again felt this season. The Jonathan and similar varieties belong to the former class, Rokewoods to the latter.

Table VII. refers to Jonathan apples grown at Drouin, being the same apples as those considered in Table III. The examination, however, from which these figures were obtained was made two months later than in the previous instance, the apples having been in this instance about six months in store. The scalded apples from the previous examination were, of course, removed, the study here submitted covering the then sound apples. Although all the examinations reported were made on the same day, observations were continued on some of the lot received second, for three weeks longer, to note whether any increase of breakdown took place. This was done to ascertain whether the difference in results was due to longer storage with the first lot than with the second, or not. The increase of breakdown, however, was negligible. As stated before, the weather for a long time before the first picking and between the two pickings was dry. With the exception of B4, all the fruit was wrapped in sulphite tissue paper.

Table VII.

Condition.	Sound Per Cent.	Breakdown Per Cent.	Mould Per Cent.
A.			
1. At 32° F. picked 20th March, 1923 ..	50	50	0
2. Picked 17th April, 1924	92	7	1
B.			
Stored at 36° F.			
1. Picked 20th March, 1923	11	88	1
2. Picked 20th March, 1923, ventilated ..	44	53	3
3. Picked 17th April, 1923	92	4	4
4. Picked 17th April, 1923, oiled wrapper	97	3	0

Table VIII. refers to Stone Pippin apples which were grown at Tyabb. These were picked at two different stages of maturity, but were in all other respects treated as uniformly as practicable, the fruit being stored at 34° for a period of six months.

Table VIII.

	Fruit Picked 15th April, 1924.	Fruit Picked 30th April, 1924.
Sound	55 ..	97
Breakdown	11 ..	1
Scald	34 ..	2

These results seem to indicate that relatively immature fruit is more susceptible to breakdown than is mature fruit. They are not in accord with those obtained by R. Waters in his studies of "flesh" collapse in New Zealand apples, which is apparently, from description, a similar disease to this form of internal breakdown, nor with those of Overholser, Winkler, and Jacob.* Secondly, the figures given in Table VII. indicate that the breakdown is perhaps more severe at 36° than at 32°. Compare results shown in A with B of preceding table. Also see last season's report on this trouble. (*Journal of Agriculture*, April, 1923.)

The trouble in Rokewood apples, which belongs to the second class of breakdown mentioned previously, was commented upon last season, when it was believed that the disease was worse at 32° F. than at 36° F

Table IX. refers to Rokewood apples grown at Drouin, in Gippsland, and stored at two different temperatures, with the Direct Expansion system of refrigerating. Two two-case lots of 2½in. apples were forwarded at different times, the first lot being picked and despatched on the 30th April, 1923, and the second lot on the 6th May, both lots being received and stored about a day and a half after their despatch. Both lots of apples were picked from the same two trees, and were stored for six months before the final examination. In each case 50 apples were dissected to determine their condition. The results given were obtained with fruit examined immediately upon its removal from cool store.

Table IX.

	Fruit Received 2nd May, 1923.		Received 8th May, 1923.	
	Stored at 32° F.	At 37° F.	Stored at 32° F.	At 37° F.
Sound	9	26	30	25
Internal Browning	41	24	20	25

These cases were again examined two days after their removal from store, when a further series of apples was examined from each lot. The results are given in Table X., being actual numbers examined.

Table X.

	Received 2nd May, 1923.		Received 8th May, 1923.	
	At 32° F.	At 37° F.	At 32° F.	At 37° F.
Sound	0	7	7	10
Internal Browning, severe ..	14	13	5	12
Internal Browning, slight ..	3	1	14	12

Besides these apples received from Gippsland, others from Beechworth, being as far as possible the duplicate in treatment as to picking time and storage treatment, were received. Beechworth is in the north of Victoria, and climatically is much drier and warmer than Gippsland.

* Overholser, Winkler, and Jacob, Bull. 370, Agr. Exp. Sta., Berk., Calif.

The soil is sandier, poorer in quality, but naturally better drained. The development of internal browning after the same storage period and subsequent to removal was not more than 4 per cent. in the worst sample; only five apples in a total of 250 apples examined showed any internal browning at all. There is some indication that Rokewood apples stored at 32° F. suffer more severely from internal breakdown than do apples stored at 37° F. However, the evidence from the tables given above does not establish these points at all definitely, since the differences between the totals of all the apples of each particular maturity, and, secondly, of all the apples at each storage temperature are 20 per cent. and 12 per cent., respectively, which, in an experiment of this kind, extending over such a short period, is hardly significant.

Bitter Pit.

An experiment was designed to estimate, and possibly illustrate, the importance of allowing apples which are liable to bitter pit to reach a certain degree of maturity before picking. Two case lots of Anne Elizabeth apples, grown at Drouin, were used in the experiment. These apples were grown on trees which in previous years were well known to produce pitted apples. They were picked from the same set of trees, but despatched on two different days, the 28th February and the 21st March. They were free from pit, though at the time of the first picking there were a few pitted apples, and at the time of the second picking, quite a large number of pitted apples remaining on the trees. One case in each consignment was stored at 32° F., the other at 35° F. for the first two months, and at 37° F. for five subsequent months.

Table XI. refers to these apples after their having been in store for two months. The figures derived from examining case lots of $2\frac{3}{4}$-in. diameter apples are reduced to percentages.

Table XI.

	Picked 28th February, 1923.		Picked 21st March, 1924.	
	(1) At 32° F.	(2) At 35° F.	(3) At 32° F.	(4) At 35° F.
Sound	70	78	92	94
Pitted	30	22	8	6

These apples were returned to store and examined again five months later, and the following table gives the details of the latter examination.

Table XII.

	Picked 28th February, 1923.		Picked 21st March, 1924.	
	(1) At 32° F.	(2) At 37° F.	(3) At 32° F.	(4) At 37° F.
Not pitted	47	79	85	85
Pitted	37	21	15	14

By the time of this second examination deterioration from other causes was a factor, and some difficulty arose in determining to which section some apples belonged. This may explain the discrepancy between the figures in column 2 in Tables XI and XII. These results confirm those of last year in that fruit picked early apparently develops more bitter pit in store than does fruit picked late. After two months of storage there was no definite differences between the apples of each picking as a result of storing at 32° F. and at the higher temperatures used. This varies from last year's experience.

Glassiness or Water Core.

Some Rokewood apples grown at Drouin were found to be affected with water core, but none so badly that the seed cavities were filled with fluid. Dr. O'Gara* has shown that apples in this condition, if stored in a cool place (not cold storage), will, in the course of three weeks or so, return to normal condition.

This conclusion was tested by an experiment in which two cases were stored in a cool passage, the temperature of which remained at about 50° F. Fifty apples from each of these two cases, one of which contained 2½-in. apples, the other 2¼-in. apples, were cut in two, and 56 per cent. and 48 per cent., respectively, showed water core. Subsequent examinations of other apples in these lots, three weeks later, showed only a trace of water core in one or two individuals. Portions of these cases were stored at 32° and 34° F. These apples, when examined six months later, were quite free from water core.

CITRUS.

Experiments were conducted this year to test whether the keeping quality of oranges, as determined by the amount of mould decay developing, varied with the time that fruit was picked. The fruit was picked and "sweated" for one week before being forwarded and placed in cool store for a period of three months, when it was examined.

Table XIII. refers to Washington Navel Oranges, grown at Riverside, and forwarded on the dates indicated. The figures are expressed as percentages, being the results from three cases stored on each day. The fruit was not wrapped in any instance.

Table XIII.

Date Forwarded.	Sound.	Mould *Penicillium sp.*
24th July, 1923	92	8
25th August, 1923	73	27
1st September, 1923	84	16
20th September, 1923	98	2

* Phytopath III, 1913, p. 21.

Table XIV., Giving the Rainfall in Inches for the Months of July, August, and September at Benjeroop, near Riverside.

Year.	July.	August.	September.
1923	3·66	·78	1.63
Average	1·12	1·41	1.35

It is evident, however, that a large number of experiments of this kind are necessary before any conclusions can be drawn.

A second experiment was arranged in order to compare the keeping qualities of oranges grown in different districts. With the exception of Riverside, where arrangements miscarried at that time, all the oranges were received about the middle of August. The fruit was forwarded by different growers, who each exercised great care in handling, the fruit being "sweated" and forwarded unwrapped to the cool store, where they were stored for a uniform period of three months. Table XIV. refers to these Washington Navel oranges, and also includes the average of the figures of the results of the Riverside fruit stored on the 24th July and the 25th August, 1923, from Table XII. above.

Table XV.

Place.	Date Fruit Received.	Percentage.		Rainfall.	
		Sound.	Mould.	July.	August.
Curlwaa	15.8.23	100	0	2.19	.77
Riverside	Average 25.6.23 and 24.7.23	82.5	17.5	3.66	.78
Picola	13.8.23	69	31	2.98	.22
Cobram	12.8.23	63	37	3.87	.88

The soil at Curlwaa is grey Murray silt, deep, fairly fine; the surface is flat, and the soil generally well drained. The grove from which this fruit was obtained is situated on an ana-branch of the Murray River. At Riverside the soil is a dark grey river silt, of fine clayey texture, the subsoil being finer, with here and there fine bands of gypsum running through. At Picola and at Cobram the soils of the groves where the oranges were grown are reddish fine aeolian sands, with undulating surface contours. Both groves are situated quite close to the River Murray, the banks of which at Picola are quite high, whereas at Cobram they are fairly low.

Last season it was determined by an experiment that fruit wrapped in tissue paper "kept better" than fruit wrapped in waxed papers or not wrapped at all, the keeping quality being determined by the number of mouldy fruit at the end of a three months' storage period. Experiments with the view of further examining this conclusion were inconclusive, since the series of oranges used remained perfectly sound for four months, with the exception of the unwrapped fruit, where only two oranges in a total of 110 were mouldy. However, the appearance of the

tissue-wrapped fruit was much superior and brighter than that in the other cases, which difference also reflected in the sale of the fruit. For a similar reason to the above, the experiment designed to test the best storage temperature was inconclusive, though indirect evidence supported last year's conclusion, viz., that 32°-34° F. is a better storage temperature over a three months' period than 37° F.

A grower, experimenting for himself, forwarded a case of oranges which had been dipped in approximately a 1 per cent. solution of bluestone. The result was an absolute failure. Examination with a hand lens revealed crystals of bluestone, with an area of dead skin surrounding them, into which moulds had penetrated and grown.

"Browning or Spotting."

This trouble was referred to last year. This season the discolouration was serious in oranges which had been picked during the moist season, even though they were "sweated" as usual. Some such oranges showed 25 per cent. browning. Other oranges, especially those picked late in the season, were practically free from browning. At this time the weather was much drier. Browning was equally bad under the different temperatures employed, the different systems of refrigeration, and, in the wrapping-paper trial, with the different papers used.

SOFT FRUITS.

Investigations on this subject, planned on an extended scale, were curtailed on account of the absence of many orchard supervisors from their districts. Arrangements in the hands of these persons had, therefore, in many cases to be dropped. Experiments were carried out with apricots, plums, pears, and peaches. Besides experiments in their storage locally, an experiment in sending fruit overseas was conducted with this latter class of fruit.

Apricots.

Several trays of apricots were received from the Kyabram district during January. The tests were confined to storing each of the varieties mentioned below at different temperatures for a period of six weeks, and then examining them. Mansfield, Moorpark, Tilton, and Blenheim Seedling were the varieties stored.

The general results showed that mould development was greater at 37° F. and 35° F. than at 32° F., but that the apricots stored at the higher temperature retained their flavour better than did the fruit stored at the lower temperatures, though the differences in flavour retention were more marked when comparing different varieties. Blenheim Seedling was the best in this respect, being followed by Moorpark, Tilton, and Mansfield in that order. The fruit in each instance was selected by the orchardist as being in firm, ripe condition. The fruit in one set of trays of Tilton apricots was picked four days later, and forwarded immediately to the cool store. These apricots, however, were inferior both in respect to their flavour and the extent which moulds had developed.

Plums.

Wickson, President, and Fellenberg plums were stored in much the same manner as the apricots. Unfortunately, the Wickson plums were delayed in transport, taking four days in all to reach the cool store after being picked. All of these plums stored well for about three weeks, but after this became soft, though not dry. The softening, which was accompanied by browning, commenced at the stone, and when badly affected the fruit had quite a transparent appearance. In some instances both green (*Penicillium sp.*) and grey mould (*Botrytis cinerea*) developed. These plums did not keep nearly as well as was expected from their American reputation (*vide Cold Storage as an Aid to the Marketing of Plums*, by E. L. Overholser, Bull. 344, Agr. Exp. Sta., Berk., Calif.).

The President plums were picked when firm, retained a good flavour, and kept in excellent condition for six weeks, and in good condition for two months. The Fellenberg plums all round were not so good, and at the latter examination these plums were commencing to turn brown and rot at the stone. Both these varieties soften slightly during storage, together with some slight apparent drying. In this respect they were quite different from the deteriorating Wickson plums.

Peaches.

Zerbe, Hales, Pumps, Elbertas, Smith's seedlings, and Catherine Ann peaches were stored and kept under observation for six weeks. Most of this fruit was grown in the districts about Melbourne. The fruit was carefully selected and packed with wood wool in trays. Each peach was "nested" and wrapped in a single tissue wrapper. On the average there were 24 peaches per tray. This treatment served to reduce the loss from moulds to a minimum, which losses so reduced, over a two months period, were very small indeed. The varieties among themselves differ in the manner in which they retain flavour and their relative susceptibility to breakdown, or really its preliminary phase, "mealiness", which is a very characteristic condition in peaches after they have been in cool storage for a certain time. The time of incidence of "mealiness" is not only dependent on the variety under study, but is also determined by temperature, to a lesser extent by its maturity, and probably by the climatic conditions during the growing season. Test trays stored showed that the Zerbe, Hale, and Pumps seedling peaches kept well for six weeks, the Hales peaches possibly being the best, especially in regard to flavour retention and freedom from "mealiness." The Elbertas did not store at all satisfactorily, becoming quite acidic to the taste, mealy and also losing their flavour. The Smith's seedlings kept well for six weeks, being then sweet, but just at this time commenced to become mealy. All these fruits were stored at 32°—34° F. More detailed experiments were carried out with the Catherine Ann peaches, fruit being stored at different temperatures and at two different degrees of maturity. Fruit at 37° F., after six weeks, was much riper than fruit stored at 32° F. Fruit stored at 32° F. remained free from "mealiness" for 10 days to a fortnight longer than the fruit stored at 37° F.; 40 days in cool store was the maximum period that the fruit stored at 37° F. remained free from "mealiness." Some of this fruit held at room temperature remained sound and in excellent condition for six days, whereas fruit from the same consignment, but which

was left in store for three days longer, became mealy on removal, and did not recover its normal condition. It was found that hard ripe fruit after storage was better both as regards taste and aroma than green or fully ripe fruit. Besides this, fully ripe fruit is more subject to mould decay losses and, in some circumstances, especially to that caused by the Brown rot fungus *Sclerotinia cinerea* (Bon) Wor. This fungus, which may not show its effects on the fruit while on the tree, must always be recognized as an important factor in the storage of fruit from districts where the disease is prevalent. Peaches, plums, and nectarines when they reach a certain degree of maturity, such as is required to give a successful storage product, are then apparently more sensitive to the ravages of this fungus, especially since the conditions generally in the cool store are favourable to its growth.

Trial Shipment of Peaches.

During February, a trial consignment of peaches was shipped to London per s.s. *Esperance Bay*. The peaches, variety Catherine Ann, were grown at Doncaster. They were plucked on 14th February and carefully packed into flat cases, the sides of which were removed. The fruit was removed to the local cool store on the same night and placed in the cool chamber. It was packed next day in soft wood trays 18 in. x 14 in. x 3 in., being graded both for size and colour being mostly $2\frac{3}{4}$ in. or 3 in. in diameter. The peaches which did not become wetted as the result of moisture condensing, were wrapped in a tissue wrapper and "nested," so that each peach was separate, being surrounded by wood wool. In this way most trays contained 24 peaches. The peaches were left in the local cool store over night and were transported by motor lorry to the Government Cool Store next morning (16th February, 1924). On the morning of the 19th February a further lot of 10 trays of Catherine Ann peaches from Doncaster was received. These peaches were packed in shallow trays with wood shavings. The fruit was much riper in this consignment than in the first one. Four trays were repacked according to the same manner as the first one. This fruit, considering the time it was received, was hardly pre-cooled at all.

The whole of these peaches was stored at 32°—33° F. till the evening of 19th February, when they were taken in an insulated truck to the ship's side. They were loaded next morning, the engineer accepting the advice to hold the temperature at 34° F. with 1° variation either way; this standard, with the exception that on one morning when the temperature at the chamber bottom was low, was, according to log, well adhered to.

The peaches were discharged from the boat on 3rd April. The report received from the office of the Agent-General stated that "trays of the first consignment packed with 24 peaches to the tray, arrived in good condition, correctly packed, and realized 25s. to 27s. 6d. per tray. The peaches in tray A21, which contained 30 peaches, were affected by frost, a number being bad." In the absence of detailed information concerning tray A21, it is considered that possibly some confusion may have arisen in distinguishing between "mealiness" mentioned earlier in this report and really frozen peaches. The agent in London in a letter stated "evidently there is a future for Australian peaches." In an article on the future of the South African fruit trade in the Handbook to the Trade, Industries, &c., of South Africa, 1923, it is

also stated that "in the near future South African growers of peaches may suffer considerable competition from Australian consignments."

An estimate of the cost per tray of shipping these peaches is as follows (This figure does not include transport to cool store at the point of export:—

	s.	*d.*
Tray	0	11
Wood-wool	0	3
Packing	0	4
Cooling	0	3
Cartage to ship's side	0	2
Freight on sea	1	7
Insurance, Disbursements, Commission in London	2	1
	5	7

WILLIAM'S BON CRETIEN PEARS.

These experiments were conducted with fruit packed in trays received on two different dates, viz., 18th February and 25th February, 1924. The fruit was grown at Kyabram in the Goulburn Valley. Half-a-dozen pears were taken out at different intervals and examined. The notes taken at these examinations are given below in table XV. It is interesting to note that very few of the pears examined showed fertilized seed, though the fruit was in no other way abnormal.

Table XVI.

Temperature.	Date removed from Store.	Date examined.	Fruit received 18th February, 1924.	Fruit received 25th February, 1924.
32 deg.	9.4.24	23.4.24	Fruit becoming mouldy, but edible	Riper, becoming brown in centre
34 deg. ..	,,	,,	Free from mould, one with "brown end," taste fair	Free from mould, well coloured, over-ripe, brown in centre
36 deg. ..	,,	,,	One with "brown end," all somewhat mealy, brown in centre	One with "brown end," all somewhat mealy, brown inside
32 deg. ..	23.4.24	29.4.24	Slightly wilted, ripe, free from mould, flavour good, slightly tart	Ripe, firm, good taste, flesh slightly hard
34 deg. ..	,,	,,	Wilting, taste slightly tart, and dry, good colour	No wilting, colour good, flavour very fair
36 deg. ..	,,	,,	Wilting, two with "brown end," taste fair, dry, not mellow, and sweet	Four with "brown end," no wilting
32 deg. ..	9.5.24	14.5.24	Appearance good, well coloured, flesh hard, taste good, but not mellow	Fruit sound, colour good, taste excellent
34 deg. ..	,,	,,	Four with "brown end," taste fair, flesh dry	All sound, no "brown end," taste good
36 deg. ..	..	..	All samples were affected with "brown end"	
32 deg. ..	28.5.24	5.6.24	All sound, somewhat dry, taste good	
			All showing "brown end"	Three with "brown end," two sound
			All pears in both lots affected with "brown end"	

The inadvertent delay in examining the first lot of pears after its removal from store probably accounts for the condition which they were in, as reported above.

"Brown end" is an abnormality frequently associated with William's pears after they have been in cool store for some time. Generally, the stalk end portion of the fruit is first affected, the skin turning brown, as if it were dead, while the flesh subjacent does not ripen and soften in the usual manner. It remains firm, for quite a long time, having a peculiar taste and eventually break down gradually.

The results above show that William's pears give the best results when stored at 32° F. There is little difference between the earlier and the later picked fruits, though possibly the later picked fruit might be considered to be the better of the two.

Summary.

A comparison between two lots of apples where the main difference was one of maturity showed that earlier picked fruit suffered much greater loss from scald than fruit picked later. While picking the fruit at the correct maturity is apparently the most important factor determining scald incidence, efficient ventilation and the use of well oiled wrappers alleviate the disease.

Scald appears to be due to a volatile principle emanating from apples which gas may be given off in different quantities, from different varieties, and from apples of the same variety, but in different stages of maturity.

Jonathan Spot is characteristic of fruit which has been allowed to ripen too much before storage.

The storage temperature used affects the incidence of internal break-down in Rokewood apples. Low storage temperature seems to increase the severity of this disease.

Early picking of fruit liable to Bitter Pit is useless and perhaps bad, since certain fruits appear to be so constituted that they will in time produce the symptoms of Bitter Pit.

Apples not too badly affected with water core will return to normal if stored in a cool place. The rate of this return is affected by the storage temperature.

An account is given of the relative keeping qualities of citrus fruits from the different growing areas.

The incidence of "browning" in oranges is affected by humidity conditions at picking and packing time. The presence of much moisture at this time probably aggravates the disease.

Some observations on the storage quality of different varieties of soft fruit have been recorded. With apricots and plums, moulds seem to be less prevalent at 32° F. than at 36° F. though the reverse applies to the quality of flavour after storage. However, the variety is the most important single determinant of flavour.

The onset of "mealiness" is an important factor affecting peach storage. The time at which this happens is dependent, among other things, on the storage temperature and on the variety. An account is given of an overseas experimental shipment which met with success. Some observations on William's Pears picked at two different times and stored at different temperatures have been recorded.

FARM BOOKKEEPING.

By T. Forristal, L.I.C.A., State Treasury Department.

Introduction.

Though there are many text-books on general bookkeeping, very few of them deal at any length with farm bookkeeping, and it must be admitted that the devising of a method which can be easily grasped, and carried out by untrained men with a minimum of attention, is not by any means easy.

The keeping of financial records can be commended on the ground that they add to the farmer's knowledge something of a practical and valuable nature. If a man does not know his business in terms of profit and loss, he is working in the dark. The education gained from well-directed account keeping is not only practical, but has a personal and intimate interest and effect on the progress of the individual. Accurate and sound financial records show where losses occur, and the methods of farming practice which have been most profitable. In other words, they bring the result of the year's work before the farmer, and afford a guide to the sound course of action in the future.

Farm Valuations.

In opening accounts either for the first time or at the beginning of a new period, the first matter for consideration is *capital*. Capital is the money invested in the farm, and the several items over which it is spread (live stock, land, buildings, implements, &c.) are the farmer's assets. Nothing can be done until these assets are valued. The method of valuation to be adopted will depend upon whether the accounts are being opened for the first time, or whether they are merely the figures from another year. In the first case, the valuation will be a matter of estimation. It is important to remember that this estimated value is for one year only, because at the end of a year the farmer will be enabled from his records to assign real values for the most part to his assets—that is to say, the cost of their production.

In the case of books being opened for the first time, the procedure would be as follows:—Beginning with the live stock, take a note-book, and make out a list of the horses, cattle, sheep, pigs, &c., showing the total number and value of each. In making this valuation, great care is required to see that the stock is not overvalued. In my opinion, the best method to adopt is to ascertain the average value per head, having regard to age and quality, and fix this amount as a standard valuation. If valued in accordance with the current market price, it would show the probable amount that could be realized if the stock were sold; but they cannot be disposed of, as they are required for carrying on the farm operations. At the end of the year the market may fall considerably, with the result that the stock will be included in the accounts at a lower valuation than they were at the beginning of the year, thereby indicating losses which are not really sustained.

Land.

If accounts are being kept at the time of purchase, land should be valued at original cost, but if the books of account are opened after the

land is in the farmer's possession it should be valued at a fair market rate. Any special assessments levied (usually applying to city rather than rural properties), attorneys' fees, recording costs, or other necessary expense up to the time the title passes to the farmer, could be added.

If the property has been purchased as a going concern, with the house built and fences erected, the one account will suffice; but if unimproved land is obtained and the additions made subsequently, it will be preferable to open up separate accounts for each—land account, building account, &c.

Plant.

If new, it should be valued at actual cost, otherwise its value would have to be estimated. New plant, if any, purchased during the year would be added to the capital cost. Should portion of the plant be fixed and portion movable, and the fixed very heavy, it would be advisable to open separate accounts for each, as different allowances have to be made for depreciation.

Farm Products on Hand.

Grain, chaff, hay, &c., ready for sale or use, should be valued at a fair average rate. This would prevent the accounts showing profits or losses which are not sustained owing to fluctuation in the market price.

Growing Crops.

On the Government Research Farm at Werribee and the Experimental Farm at Rutherglen, growing crops are valued at the cost of labour, seed, and manure used. This is a good practice, as it prevents any overestimate of valuation, the benefit of any profit going to the year in which the harvesting is done.

Furniture and Domestic Effects.

A fair estimate of the value of furniture, &c., could be made by the farmer himself; otherwise he would have to ascertain the actual cost, add the cost of any additions made by himself or a tradesman, and deduct a reasonable amount for depreciation.

Books of Record.

The only books required are stock book, wool press book, and a diary. The stock book should contain particulars of all stock received and quitted, whether by death, sale, or any other means, and should show the balance on hand. This book should have a separate opening for each kind of stock, viz.:—

Sheep.—A tally of the sheep as ascertained at shearing time should be entered; it should be divided under various headings, such as rams, ewes, wethers, &c. The number of lambs will be ascertainable at the time of lamb marking. Additions of the number of lambs and of any purchases of sheep must be made to the stock disclosed at shearing time, and a deduction made for any sales. From the result so ascertained, there will be deducted the number killed for rations and also a percentage, based on previous experience and the state of the season, for deaths. The result will give a very close estimate for the sheep at balancing period. This does not apply to farmers who deal in sheep on only a small scale, but more particularly to stations.

Horses.—Foals should be entered in the stock book when dropped.

Cattle.—Cattle should be noted under different headings, one for bulls, one for cows, and another for calves. Calves should be recorded under this latter heading until sold, except those that are kept to supplement the milking herd; these should be transferred from "calves" to "cows" when they drop their first calf or at the beginning of the season. Special note should be kept of any pedigreed cattle.

Pigs.—A note of these can be kept under one heading, and the young stock entered in the stock book about a week after they have been littered, by which time the number likely to be reared will be known.

Poultry.—Unless the farmer makes a speciality of them, it is hardly worth while keeping a record. The value could be estimated at balancing period.

Wool-press Book.

As the wool is cut from the sheep's back it is classed by the wool-classer. Each class of wool is kept separate, baled up, and marked accordingly. The wool-press book is used for keeping a record of the number of bales filled and the class of wool contained therein.

Diary.

This book should contain particulars of the several operations on the farm, and should be written up every evening. If done systematically each night, it is at the most half-an hour's work, but if left for a week might become a laborious task, and, further, items might then be forgotten and left out altogether. I would strongly advise farmers, when purchasing a diary, to obtain one of foolscap size, so as to allow themselves plenty of room to make their records. The first entry should be a list of the stock on hand. Any item of interest whatever, such as due dates of rents, rates, insurance premiums, mortgages, promissory notes, &c., should be recorded. When writing up the diary, the farmer should glance a few pages ahead to see whether there is anything entered which requires attention.

Principles of Account-keeping.

Having dealt with the system of farm valuations and books of record, we come to the actual principles of account-keeping. The correct method to adopt is that known as "double entry," which derives its name from the fact that every transaction recorded is a double entry—that is to say, there must be a "debit," as it is called, and also a corresponding "credit." The receiver is debited with the amount, and thereby becomes the "debtor," and the giver is credited with the same, thereby becoming the "creditor." Thus, if grain be sold to John Jones, he being the receiver of the grain, is debited with the amount in the books, and the seller or giver is credited with it. This transaction is noted by placing the amount to the credit of the account called "Fodder a/c." or "Sales a/c." When John Jones pays the amount due for the grain, the receiver's "cash a/c." is debited, and John Jones, being the giver, is credited with the amount, thereby closing it off. The terms "debtor" and "creditor" are used on the general principle that every transaction, whatever its nature, concerns two accounts, or has two aspects, that of a receiver and that of a giver. The following rules could be well kept in mind:—

(*a*) Debit the receiver or that which is received; credit the giver or that which is given.

(*b*) Debit losses; credit gains.
(*c*) Every debit must have a corresponding credit.
(*d*) The sum of the debits must equal the sum of the credits.

If the first two rules are clearly grasped, the remaining two may be dispensed with, as they are merely the logical outcome. Custom has led to the placing of the debits on the left-hand side of the page, and the credits on the right.

The actual accounts themselves may be divided into three classes, viz., real or property, personal, and nominal. Real or property accounts refer to assets such as buildings, machinery, plant, &c., personal to those relating to persons, and nominal accounts are those of transactions involving profits or losses and expenses, such as rent, wages, insurance, &c.

Every transaction or exchange involves something coming in and something going out, and in consequence if the books record the transactions properly then they must show both aspects, so that there must be a double entry of each transaction—that is, a debit for the incoming and a credit for the outgoing; it necessarily follows that the essential principle involved is that every debit must have a corresponding credit.

Having explained the main principles of keeping accounts, we next deal with the actual accounts themselves. For this purpose three books are required, viz., the journal, cash book, and ledger.

The Journal.

The journal is a book in which all transactions affecting the accounts other than those entered in the cash book have to be recorded in such a way that the particulars of the transaction may be posted into the ledger under the proper headings, thereby showing readily what is owed to or owing by the farmer with regard to the transaction recorded. The journal is the book of original entry, and every transaction must be posted (explained later) from it or the cash book to the ledger. The main factor in journalizing is to decide which class of accounts the transaction affects, and then ascertain which account has to be debited and which credited.

The following is an illustration of writing up the journal:—

1924.
Jan 3rd. Purchased manure from J. Nelson, £6.

Date.	Particulars.	Folio.	£	*s.*	*d.*	£	*s.*	*d.*
1924.								
Jan. 3	Crop A/c .. .. .. *Dr.*		6	–	–			
	To J. Nelson A/c .. *Cr.*					6	–	–
	Being purchase of manure							

When the above entry is posted into the ledger, the item will show as a debit to crop a/c., and a credit to J. Nelson a/c. When payment is made, the credit side of the cash book will show a payment of £6 to J. Nelson, and this entry posted into the ledger will close off Nelson's a/c. In actual practice, if the payment is made before the end of the month, the transaction would be treated as a cash one, and would be put through the cash book without involving Nelson's name. The entry would then

be, "Debit crop a/c.," and the amount would be shown on the credit side of the cash book.

Any adjusting required should be recorded in the journal, because, as stated previously, no entry must be made in the columns of the ledger except the postings from the cash book and journal. Adjusting entries occur mostly at the closing of the books to complete the profit and loss a/c. and the balance-sheet at the end of the year. These adjusting journal entries occur more frequently when it is desired to ascertain the profit or loss on the different branches of the farm. For instance, in dealing with, say, the crop and cattle a/cs., an estimate would have to be made of the feed grown on the farm and supplied to the cattle. An adjusting journal entry for this amount should be made, debiting cattle a/c. and crediting crop a/c.

The Cash Book.

All payments and receipts, whether by cheque or in money, should be noted in this book. Receipts are to be entered on the left-hand page. When dairy produce, wool, pigs, grain, or anything else is sold for cash, the amount should be credited to sales a/c. When money is received from a person on account of or in settlement of something which has been charged up to him in the ledger, the money must be entered to his credit.

Payments should be recorded on the right-hand page. When any one who has a ledger a/c. is paid a sum of money on account, or when any settlement is made with him, the payment (whether cash or cheque) must be shown to his debit here; but when cattle, sheep, fodder, &c., are bought and paid for in full, purchases a/c. should be debited, and the amount credited in the cash book. The cash book can be treated as a cash account.

The Ledger.

The ledger is a book which contains the classified record of transactions. It is ruled with columns for date, name of corresponding credit entry, journal folio, and amount on the debit side, with a corresponding number of columns on the credit side. This record is made by "posting" from the journal and cash book the amounts as shown therein to the debit or credit of the accounts concerned. No amount should be entered in the ledger direct, but must first be put through the journal or cash book. The left-hand side is the "debit" side, and all the debit entries are to be made there. The right-hand side is the "credit" side, and all credit entries must be posted there.

Specimen Form of Ledger.

Dr. *Cr.*

Date.	Name of corresponding Credit Entry.	Cash Book or Journal Folio.	Amount. £	s.	d.	Date.	Name of corresponding Debit Entry.	Journal or Cash Book Folio.	Amount. £	s.	d.

Posting.

Reference has been made to "posting" the entries from the cash book and journal into the ledger. This posting consists of making an entry in the ledger under the proper heading, such as "sales a/c.," "purchases a/c.," of the entries which appear in these books. In all the books a narrow column is provided next to the money columns, so that in the ledger the folio of the cash book and journal from which the entry is taken may be put; and in the cash book and journal a note of the folio of the ledger into which it has been posted may be made. This will enable one to see that everything is posted, and it will also be a means of checking the postings readily.

Trial Balance.

When at the end of the year it is desired to make out a profit and loss a/c. and balance-sheet, the first procedure is to take out a trial balance. This is done by adding up all the accounts in the ledger (usually done in pencil), and the accounts taken out on a sheet of paper to see whether the books balance. First of all, particular attention must be taken to see that all entries in the journal and cash book have been posted into the ledger. If the entries have been made correctly, and posted correctly, the two sides of the sheet will balance. This will show that the books so far are correct, and that, therefore, the recording of "closing entries" may be gone on with. This rough sheet is called the trial balance, and is not required when the accounts are complete. It does not necessarily follow, because the two columns balance, that the postings must be correct, inasmuch as there may have been an entry on the right side, but posted to the wrong account, or a posting to the wrong side, with its corresponding entry also on the wrong side. The making up of a trial balance has so many distinct advantages that it must never be dispensed with. Any error should be at once looked for, because if allowed to remain the balancing entry will also be wrong, and it will be practically impossible to compile a correct profit and loss a/c. and balance-sheet.

As it is necessary to take stock at the beginning of the year, either when opening books for the first time or when commencing operations, so it is necessary after recording the year's transactions in the books to take stock at the end of the year, as otherwise it is impossible to arrive at a profit and loss statement. The taking of stock should be done on the 30th June or next day. The reason for fixing the 30th June as a suitable date for the end of the farmer's year is that income tax returns have to be filed for the year ending on that date, and by arranging his balance-sheet for a similar date he will have all the data available for the compilation of his tax returns.

After the "trial balance" has been made and stock taken, the next step is to make the "closing entries." These entries are for the purpose of transferring the results of the transactions recorded in the various accounts to profit and loss a/c., thereby showing what profit or loss has been made. This account must be debited with expenses and losses and the stock on hand at the beginning of the year, and must be credited with the sales, &c., and the stock on hand at the end of the year. If the account is in credit, there has been a profit, and vice versa, and the result must be carried to the debit or credit of capital account accordingly. When these entries are completed and posted into the ledger, the farmer will be able to ascertain from the profit and loss a/c. the amount of the profit or loss on the year's operations.

Chief Accounts Necessary.

Having stated as simply as possible the main principles of farm bookkeeping, it is perhaps advisable to explain some of the principal accounts that a farmer would have to open up:—

Capital.—This, as the title suggests, will show the total of a man's capital.

Profit and Loss.—This will show how much the farm has earned or lost during the year.

Land.—This account is opened with the value of the land as at the date of commencing the keeping of accounts. For this purpose the present value should be taken, but care exercised that it is not overestimated. If further land adjoining, or nearly so, is bought to be used with the home farm, the cost can be added. Should other land be bought, not for use with the home farm, a separate account should be opened.

Buildings.—This account is opened by debiting it with the cost of erection, or appraised value at the time of opening the books. Should any additions be made during the year, such as building a wool-shed or making any permanent improvements, the cost should be charged to this account. At the end of the year an allowance must be made for depreciation. Repairs must not be charged to this account, but be debited either to a separate account or to general expenses a/c., and closed off at the end of the year to profit and loss a/c.

Furniture.—This account is similar to buildings a/c. It is charged with the cost at the beginning of the year, plus additions, and an allowance made for depreciation at the end of each year.

Machinery Implements.— It is advisable to open up one account for machinery and implements. It should be charged with the cost of machinery on hand when the account is opened, and the cost of any new machinery, implements, &c., purchased must also be charged to it, and at the end of the year an allowance must be made for depreciation (see page 602). The remarks made regarding repairs when discussing buildings a/c. apply here also. It is not recommended that the cost of tools be entered here; their lives are so short that each year's purchases may be treated in that year's expenses.

Stock a/c.—Unless it is desired to show the result of trading under the various branches of the farm, the only entries needed are those showing the total stock on hand at the beginning and end of the period, and the incorporation of these in the profit and loss a/c. To show the result under the various sections would mean a fair amount of detail work, and some experience in accounts would be required.

Mortgage.—There may be one or more mortgages, and the records of each should be headed with the name of the mortgagee. The interest is a direct charge against the profits, and a separate account, styled interest on mortgages, shall be opened and closed off at the end of the year to profit and loss a/c. In any instance, where the payment includes principal and interest, it should be noted that the mortgage a/c. is reduced by the total payment, less the interest. For instance, a payment of £10, consisting of £6 interest and £4 principal, should be so journalized from the cash book. The total payment of £10 will, of course, be shown on the credit side of the cash book. £4 of this amount should be debited to John Jones's mortgage account, and the balance, £6, debited to interest on mortgages account. The former reduces the total liability, whereas the latter is an expense for the current year.

NATIONAL MUSEUM OF AUSTRALIA

General Expenses.—All the expenses of running the farm not otherwise provided for should be entered under this heading. Tools, sundry incidental expenses, repairs to buildings and machinery; in fact, any such expenditure as is not to be treated under a separate heading should be entered here.

Rates, Taxes, Insurance.—Separate accounts could be opened for these items, as they would be easily traceable for future reference.

Personal Accounts.—Accounts will have to be opened for persons with whom one does business, but with whom a separate settlement is not made for each transaction, that is to say those with whom there is a "running account." For instance, a farmer may buy goods from the storekeeper, and sell him produce, only having a settlement of accounts a few times a year.

In the preceding pages, I have endeavoured to present a system of book-keeping that will enable the farmer to ascertain his profit or loss for the year on the whole of his farming operations. It is considered that the farmer should make himself thoroughly conversant with this procedure, before attempting the more difficult task of endeavouring to work out the actual profit or loss on each branch of the farm operations. The latter involves so much detail work, such as segregation of wages, allocation of overhead expenses, and so many transfers and adjustments, that, if explained at any length, it would probably deter the farmer from continuing any sort of bookkeeping.

Depreciation.

Reference has been made throughout these pages to Depreciation. This may be defined as the amount by which the value of an asset decreases, either by wear and tear, effluxion of time or by obsolescence. Sheds, &c., depreciate by the effect of time on the fabric of the building or by general depreciation of property. Leases, whether of land or buildings or both, depreciate in the sense that when the lease has expired, the lessee will no longer have any interest in the property; it will therefore be necessary for him to write off the whole value of the lease before such expiry. Plant and machinery wear out in course of time, and also have a tendency to become obsolete before they are worn out, so that provision must be made for any such condition arising.

It is obvious that in order to enable the profits to be stated correctly, it is necessary to charge against profits, not only the expenses which are paid or payable in cash, but also any other losses, which have been incurred in conducting the farm operations.

In arriving at the amount to be provided each year, the cost of the asset, its lifetime, and its scrap value must be taken into consideration. If great care is taken of machinery, implements, &c., the depreciation need not perhaps be more than 5 per cent. to 10 per cent. on the diminishing value. Care should be taken to see that fair provision is made.

Crops.

Many farmers are under the impression that from a bookkeeping standpoint, crops are difficult to deal with, but unless it is desired to ascertain the profits or losses on the different branches of the farm, with the exception of the mode of valuation at the end of the year, they present no new difficulties. It frequently happens that a farmer is in a quandary regarding the value to place on growing crops, as

owing to various causes, his estimate may not be realized. It is considered that the most practicable method to adopt is to find out the cost of the labour, seed and manure used, and value the crops at this figure. This would allow any profit to go to the year in which the harvesting is done. This is the method of valuing crops grown on Government experimental farms. If the land has only been fallowed, it is not wise to make any valuation whatever.

Consignment Outwards.

These accounts are necessary when produce, grain, wool, &c., are sent to market for sale. In most cases advances are made by the agents who attend to the sale. Where no advance is made, unless considerable time elapses between the sending and disposal, it would be as well to treat such transactions as ordinary sales, dealing only with the net returns. If a considerable time elapses before the sale takes place, a consignment account may be opened. This account should be debited with the estimated value of the produce, &c., together with all charges paid by the owner or consignee. When the account sales come to hand, the net return should be credited to the account, which will then indicate whether a profit or loss has been made on the deal. Where advances have been made, the consignment account should be credited with the amount, together with the balance when received from the agent.

Orchards.

For accounting purposes, the orchard is considered in practically the same light as the annual crops. It has some peculiarities that must be reflected in the accounts, in order to show proper results, but otherwise there is very little difference.

The orchard is charged with all cost of clearing and preparing the soil, staking, purchase of nursery stock, planting, and all maintenance charges until it begins to yield say, from four to seven years. All expenses thus charged up to and including the first year of its yield are considered as adding to the value of the orchard. To these expenses is added interest on the investment for the period mentioned. The total amount then is considered to be the capital investment in the orchard. All expenses from that time should be set-off against the income from the orchard to ascertain the yearly profit or loss. A separate account called orchard income-expenditure account is opened and debited with all expenses after the first bearing year, such as cultivation, care of trees, and overhead expenses. It is credited with the income for the year from the sale of fruit. The balance is the net profit or loss on the orchard, and is transferred to profit and loss account.

Conclusion.

Efforts have been made to indicate as simply as possible, a few of the salient points connected with bookkeeping on the farm. If the instructions and notes given are fully grasped the farmer will have little difficulty in keeping his books in a methodical way. At the present time, owing to the requirements of the Income Tax Department, it is absolutely essential, to enable the farmer to prepare his returns that his books be kept correctly and in a scientific manner. In any case, I feel that those who keep correct books and records will be amply repaid for the extra labour involved.

WHEAT AND ITS CULTIVATION.

(Continued from page 473.)

By A. E. V. Richardson, M.A., D.Sc., Agricultural Superintendent.

VIII.—DISEASES OF WHEAT.

The wheat plant is threatened throughout its existence from three distinct classes of phenomena—

(A) Meteorological accidents;
(B) Fungoid diseases, (*a*) smuts, (*b*) rusts, (*c*) takeall, (*d*) mildew;
(C) Insect pests.

(A) Meteorological Accidents.

Under this heading come hail, wind, storms, flood, fire and drought. Very little specific information is available as to the amount of damage done by these agencies.

Drought.

Occasionally, as in 1902 and 1914, the State suffers from extremely dry seasons, which we dignify by the name of droughts. In such seasons there is a partial to complete crop failure, and large numbers of stock, particularly sheep and cattle, are frequently lost. Several good seasons following on such a drought are necessary to restore the numbers of stock to the pre-drought levels. As transportation facilities and water storages increase, and irrigated agriculture develops, the losses of stock which are the most serious results of drought will be largely mitigated.

Hot Winds.

Hot winds are liable to occur every year, but in some years they are relatively frequent and prolonged. They travel at a velocity of 25 to 30 miles an hour, with a temperature ranging from 95 to 110 degrees and a low humidity. These cause rapid acceleration of the transpiration rate.

The roots have difficulty, especially in the case of wheat sown on stubble land, in supplying the moisture as fast as it is evaporated by this blast of hot air. The cells of the plant are desiccated, and the plant collapses.

With the low average altitude of the Australian continent, the open character of the country, and the relative absence of shelter in the wheat belt, the wheat inevitably suffers from these winds. Yields may be reduced from 20 to 50 per cent. in years when hot winds in spring are frequent and prolonged.

Excessive Moisture.

Excessive moisture may be injurious in a number of ways. If too much water be present the wheat may be "drowned." Excessive moisture tends to develop leaf at the expense of the grain. An overwet winter may greatly reduce crop yields.

Again, rain at harvest time lowers the quality and appearance of the grain. The wheat may germinate before it can be harvested. In 1855 one-third of the Canadian crop was lost by the grain germinating in the straw.

Hail.

Hail does most damage to crops towards harvest time. Hail-storms occur somewhere every season, but, generally speaking, only in limited areas, frequently extending over but a few square miles. At Werribee, in 1915, the yields of barley on the State Farm were reduced by 50 per cent. by a hail storm on 14th November. Some varieties, e.g., skinless, were completely destroyed.

While the farmer may by careful scientific control reduce his losses by insect and fungoid pests to a minimum, the loss by such natural destroyers of wheat as hail, wind, and fire are, of course, beyond his control. In most cases the losses from these untoward events may be reduced to a small constant factor by insurance. This is especially true of loss by storm, fire, or hail. A relatively small premium will give protection against these. There are many insurance companies prepared to take the risks of loss on payment of a small premium.

Frost.

Frost does some damage every year. Late frosts are more dangerous than early frosts. In the United States and Canada large areas of wheat are "winter-killed" every year by winter frosts. The plants are either frozen to death, or lifted out of the soil by alternate freezing and thawing. A good covering of snow is a protection against frost.

In Australia there is practically no damage by "winter-killing" through frost, as the temperatures in the wheat belt in winter are rarely low enough to do serious damage to the crop. But late frosts at heading out and flowering time may cause a considerable proportion of blighted ears, and a corresponding reduction in crop yield. During 1922 a late frost in November led to a material reduction in the yield of wheat in the Wimmera.

(B) Fungoid Diseases of Wheat.

The most important are—

(1) *Smuts*—(*a*) Stinkng Smut (*Tilletia levis*)
(*Tilletia tritici*)
(*b*) Loose Smut (*Ustilago tritici*)
(*c*) Flag Smut (*Urocystis tritici*)
(2) *Rusts*—(*Puccinia graminis.*)
(3) *Takeall*—(*Ophiobolus cariceti*)
(4) *Mildew*—(*Erysiphe graminis*)

McAlpine, formerly Vegetable Pathologist of the Department of Agriculture, has dealt exhaustively with these various diseases in his illuminating works on the "Smuts of Australia" and "The Rusts of Australia." The agricultural community and the workers in vegetable pathology owe a great debt to McAlpine for his very fine researches and his pioneer work on rusts and smuts.

It is proposed here to deal only with the method of attack of these various fungoid pests, their spore forms, methods of recognizing the diseases, and mode of control.

Bunt or Stinking Smut (*Tilletia tritici and Tilletia levis*).

This disease is well known to wheat-growers. It does not make itself apparent until harvest, when the grains of wheat become filled with masses of black spores encased in a firm shell. The spores have a characteristic and penetrating odour, which is said to be due to the presence of trimethylamine.

There are two species responsible for this disease, one with netted spores (*Tilletia tritici*) and one with smooth spores (*Tilletia levis*). They have the same life history, and both may occur in the same ear of wheat. The normal mode of germination is for the spore to produce a promycelium, bearing at its apex a tuft of conidia. These conidia frequently unite in pairs and produce a secondary conidium which puts forth a slender germ tube to infect the wheat. Kuehn found that infection takes place at the seedling stage, and that the germ tube of the fungus penetrates the cells of the wheat plant in the neighbourhood of the lowest node. A mycelium is formed in the growing plant, and it grows with the plant apparently without affecting its health. It finally reaches the ovaries, and the fungus appropriates the food supply and forms a hypha which develops a dense mass of black spores.

The methods of controlling bunt have already been described. The infected seed is immersed in a solution of formalin (1 pint formalin to 45 gallons of water), or of bluestone (1½ lb. to 10 gallons of water) for three minutes. Powdered copper carbonate dusted over the seed at the rate of 1 to 2 ozs. per bushel is a very effective remedy for bunt. The copper carbonate does not reduce the vitality of the seed or delay the germination.

The immersion of the seed in hot water (Jensen treatment) for 10 minutes at 132° F. is effective, but it involves more time and labour than the other methods described.

It is generally believed that less moisture is required to germinate bunt spores than wheat, on account of the much smaller size of the spores.

Many farmers do not pickle seed for smut when sowing on a dry seed bed, though they are careful to treat the seed if it be sown on a moist seed bed. In the former case the moisture content of the soil is likely to be sufficient to start the growth of smut spores before the wheat, but in the absence of the growing host the germ tubes die. In the latter case, i.e., when seed is sown on a moist seed bed, the spores of smut and the grain germinate together and infection is almost certain to occur unless the seed is previously pickled.

Self-sown wheat is rarely attacked by bunt. Farrer showed that the early rains and dews caused the spores of the fungus to germinate, but they soon perished because there were no host plants for the germ tube to penetrate.

Loose Smut (*Ustilago tritici*).

This smut makes its appearance as soon as the wheat plant forms its ears. The husk that covers the mass of spores cracks, and the spores are scattered by the wind. The bare stem of the ear is left blackened by the smut spores that remain at the joints.

It was formerly thought that the same fungus caused the loose smut of wheat, oats and barley, but recent investigations have shown that

the forms are quite distinct. Infection of the plant takes place during the *blossoming* period. This has been definitely proved by several workers. The spores of loose smut are spread simultaneously with the blooming of the wheat. The spores adhere to the sticky stigmas of the pistil and germinate just like pollen, and send their germ tubes through the style to the developing seed. The seed ripens in the ordinary way. The infected kernels cannot be distinguished from the healthy kernels. When, however, the infected seed is sown the fungus grows up with the plant. When the plant begins the formation of ears, the young grains become filled with a black mass which is at once scattered by the wind and causes fresh infection. It is well known that seed treated for stinking smut is frequently affected with loose smut. This is because the source of infection is within the seed, and the fungus is not reached by the fungicides used for pickling for smut. The mycelial filaments are so bound up with the living cells of the embryo that the destruction of one would involve the death of the other.

The methods of controlling this disease are as follow:—

(1) Avoid using seed from a field where loose smut has been prevalent during the blossoming period, as it may be presumed that many seeds will have become infected, and these will produce smutted plants the following season.

(2) If the disease is suspected in the seed, then soaking the seed for five hours in cold water and then immersing it for ten minutes in water at 132° F. is recommended. This is known as the modified Jensen hot water method. Tests made at Werribee show that this method is very effective.

(3) Try to prevent infection during the blossoming period by pulling up and burning plants showing any signs of infection. This can be done on small plots, and is worth while where the main crop is badly affected with the disease. With a small seed area isolated from the main crop of wheat, it would be possible, by weeding out diseased plants as soon as they appear, to obtain perfectly clean seed for the main crop.

Flag Smut (*Urocystis tritici*).

This is a very destructive disease, and in seasons favorable to its spread the harvest may be seriously reduced. It is usually found on the leaves and leaf sheaths, but may also occur on the stem. It has been known in Australia for over 50 years. In 1873 Wolff showed that the fungus causing the disease was similar to that of rye—*Urocystis occulta*—but subsequent investigations showed that it is biologically distinct from the species attacking rye.

The fungus attacks the leaves, and usually it causes them to curl up and become distorted, whilst frequently no ear is formed on the stalk.

The disease was at first believed to be confined to Australia, but in 1895 it was discovered in Japan, and in 1906 in India. In 1920 both this disease and the Takeall fungus (*Ophiobolus caricti*) were recorded in the wheat crops of the United States. Flag smut has also been recorded in South Africa, Italy, and Spain.

The first indications of the disease are seen on the leaves, where it forms long grey streaks at first running parallel with the veins, and the black powdery spores are set free by the epidermis. The ruptured skin

and long black streaks suggest a kind of rust to the farmer. Hence he calls it "Black Rust." The ear is rarely formed, for the diseased ear generally becomes a twisted mass of diseased tissue.

In South Australia, where the disease has long been known, it is regarded as being in some seasons quite as injurious as rust itself.

The twisted and curled leaves breaking up and falling to the ground are the main sources of infection for the next season, and where wheat is grown without rotation the effect of the disease is cumulative.

It is not easy to detect this disease in the early stages, but towards heading the affected plants have a faintly-bluish colour in the flag. These plants fail to mature ears, their leaves become curled and abnormally grey, and give rise to streaks of fine sooty black spores.

The disease is caused by the fungus *Urocystis tritici*. The spores possess bladder-like appendages which completely envelop them and act as a protective covering. They infect the wheat at the seedling stage, or when the young shoots are formed, and generally destroy the entire stool. The disease may be distributed and progagated in various ways.

The flag drops and the smutted portions become mixed up with the soil.

Under favorable conditions the spores attack the following crop of wheat.

The withered portions may blow about in the wind. Men, animals, and implements carry the spores from one field to another, and the spores may even be distributed in the droppings of animals fed on chaff. The spores germinate, produce a promycelium and develop conidia in the form of finger like processes.

The spores are well protected by their layer of sterile peripheral cells, and are well adapted from their structure to retain their vitality for some time.

McAlpine determined that the infection occurred at the seedling stage. His experiments showed that infection occurs in the seedling stage or before the young plant has reached the surface. He also showed that spores are distributed through the soil on stubbles or in manure from horses fed on diseased hay.

Formalin, bluestone, and hot water treatment of the seed failed to prevent the occurrence of the smut when the disinfected seed was sown in the soil containing the spores. Moreover, the experiments prove that infection may arise from the *soil* as well as from spores sown *with* the seed.

The spores are capable of germinating in the soil and producing their elongated conidia, and these conidia can in turn put forth a long tapering germ tube which may eventually reach the plantlet as it emerges from the seed or the young shoots formed beneath the surface.

It may be said therefore that if flag smut spores are only on the grain and there is no flag smut in the soil, the treatment of the seed with fungicides is a preventive, but if the diseased straw is already in the soil from a previous crop, the treatment of the seed with these materials is ineffective.

To effectively cope with the disease, therefore, disinfection of the soil as well as the seed would be necessary. The former, however, is impracticable.

The following measures may be adopted to mitigate the disease:—

(1) Avoid wheat after wheat. Develop a crop rotation which will introduce a crop exempt from attack, e.g., oats or barley.

(2) Burn the stubbles of the diseased crop in order to destroy the spores and check the spread of the disease.

(3) Fallow early and fallow well. The spores germinate and find no host to thrive on and soon perish. If the land be well worked air is admitted and moisture conserved, and the germination of the spores is facilitated prior to the sowing of the wheat.

These steps assist in preventing the disease, but it is not yet known how long the spores retain their germinating power, hence the length and character of the crop rotation cannot be definitely laid down.

Clean farming, burning of wheat stubbles, and the use of systematic rotations assist in the control of this disease.

Takeall (*Ophiobolus cariceti* Berk. and Br. (Sacc)).

This disease was formerly called *Ophiobolus graminis*. The name was changed to Cariceti by Fitzpatrick, Thomas, and Kirby in 1922 (Mycologia, Vol. XIV. 1922).*

Takeall has existed in Australia for over 60 years. It does considerable damage to the wheat crop every year, and in seasons favorable to its development the crop may be almost wholly destroyed. The affected plants show characteristic symptoms.

The disease usually spreads in more or less concentric circles from the source of infection, and the plants in the centre of the affected portions may be entirely destroyed.

In the worst cases the plant dies back before the stalk appears. In less-severely affected plants a stalk may appear, but it soon becomes stunted and rarely matures an ear. If ears be formed, the grain fails to develop, and what are known as whiteheads may be seen through the crop.

Takeall and Whiteheads are two phases of the one disease. With Takeall the whole plant dies and fails to produce an ear. Whiteheads, however, occur when the fungus has not been able to progress sufficiently to completely destroy the plant.

The disease begins in small spots and gradually spreads, the wheat plants dying off in larger or smaller patches according to the virulence of the attack.

The roots have a characteristic appearance. They are stunted and deformed at an early stage, and may be quite thickened and knotty close to the stems. They are excessively covered with root hairs. If the sheath be stripped away from the base of the stem, a blackened incrustation of spores will usually be found on the affected plants.

Several other factors may result in the dying back of wheat plants, e.g., grubs may attack the roots of young wheat plants and cause decay and symptoms somewhat similar to takeall. But in such cases the whole of the crop is usually destroyed, and the disease does not occur in circular patches characteristic of takeall.

This fungus was first described by Berkeley and Broome as *Sphaeria cariceti*, the host being *Aira caespitosa*. Saccardo in 1875 described the same fungus under the name *Rhabidophora graminis*, and in 1883 he placed this fungus and *Rhabidophora* under the genus *Ophiobolus sp. graminis*. In 1922 Fitzpatrick, Thomas, and Kirby critically examined the original *Sphaeria cariceti* material and concluded that Berkeley and Broome's *Sphaeria cariceti* was the same as that described by Saccardo under the name ophiobolus graminis. They retained *Ophiobolus*, deleted *graminis*, and adopted *cariceti* as the species.

Again, where trees have been burnt on the ground, or where nitrogenous manure has been accumulated, the effects of the excess of manure or the drying of the soil on such spots may cause the plants to wither with the advent of summer, but in both these cases the dying plants would not show the black incrustation of spores at the base of the stem and the thickened knotty roots characteristic of takeall.

Ophiobolus appears to develop particularly well in soils with an alkaline reaction.

The disease is caused by a fungus, *Ophiobolus caricti*, which is very similar to the wheat stem killer of France and Germany.

The fungus affects wheat, and has been found on many native and introduced grasses, and in particular barley grass, wallaby grass, and spear grass. It also affects barley, but oats are practically immune from attack.

McAlpine showed that infection could be brought about by sowing clean healthy wheat in sand with the stubble of a crop affected with *Ophiobolus*. When the wheat plants were 6 inches high brown spots were observed on the young stems. On microscopic examination an abundance of mycelium of *Ophiobolus* was found, not only on the sheath and stem, but also in the roots. Plants grown in sand without diseased stubble were unaffected.

The mycelium lives on the tissues of the young wheat plant, and appropriates nourishment for the purpose of forming the reproductive bodies—the perithecia. The perithecia are flask-shaped spore cases, containing numerous little sacs or asci, each of which contains eight elongated sickle-shaped spores. When the spore cases are mature the asci are expelled, and the spores are set free in the presence of moisture.

The only practicable method of control of this fungus pest is prevention. The adoption of a rotation system of cropping in which wheat is grown in alternation with oats, and well tilled fallows, is the most promising method of control.

The fungus must be starved out, (1) by keeping the fallows free from any plants which may act as hosts, (2) by growing crops immune from attack, such as oats, in alternation with wheat.

The rotation suggested for this purpose is—First year, wheat (badly affected with takeall)—Burn the stubble. Second year—fallow early and keep the fallows free from barley grass, wallaby grass, &c. Third year—a crop immune from takeall. Fourth year, fallow. Fifth year, wheat. Then follow with the normal rotation. The burning of diseased stubbles followed by a crop rotation, with oats in the rotation, and a clean well-worked fallow, will greatly reduce if not entirely eliminate this pest from the wheat field.

Mildew of Wheat (*Erysiphe graminis*).

This fungoid disease is often found in wet seasons in Victoria on crops growing luxuriantly in the early stages. Excessive rains, combined with favorable growing weather, facilitate its development. In dry seasons the disease causes very little damage. The fungus is parasitic and is usually found as a greyish-white mass of spores covering the surface of the young wheat blades, especially on the upper surface. This is the mycelium of the fungus, and from this short threads (*haustoria*) extend into the epidermal cells of the leaf. By means of these the fungus derives its substance from the leaf and the leaves begin to die.

There is no remedy when it affects the crop on a large scale. Flowers of sulphur dusted on the affected leaves will cure the disease, but this remedy is practicable only on small experimental areas of wheat.

Rust (*Puccinia graminis*).

This disease is prevalent in wheat fields every year. In some seasons it causes immense damage; in others the losses are very small; they are dependent mainly on the humidity during the spring. Thus in 1889 the damage caused by rust in Australia was estimated at £3,000,000. The spring of 1889 was exceedingly wet, and during the flowering period of the wheat the weather was very humid and warm, so that the rust fungus found highly favorable conditions for rapid multiplication.

Rust makes its appearance in the spring in the form of reddish-brown dust-filled spores on the leaves and stalks of the wheat plant. These are called the Uredospores. If these spores be exposed to moisture (rain or dew) they will germinate in a few hours. If they germinate on a green wheat leaf the germ thread forces its way into this and produces within a week a group of fresh spores filled with uredospores. A number of generations of spores will follow as long as there are green leaves.

Later on in the season, or when conditions are less favorable, telutospores, or winter spores, are produced. These telutospores form long streaks of black spores filled with a black dust mass. Hence the term "black rust." There is a third type of spore called the æcidiospore, which develops on the barberry plant. These spores, however, are not normally found in Australia.

With most fungi the various stages of their life history occur on the same host plant, but in the rust family part of the life history of the fungus may be passed on a different host. They are, therefore, called heteræcious species, because their complete existence or life cycle is spread over several host plants. This heteræcism of the rusts was discovered by De Bary in 1864, when he proved that *Puccinia graminis* produced its uredo and telutospores on the gramineae whilst its æcidial stage was developed on the barberry.

Heteræcism is only possible when more than one spore form occurs in the life cycle of the fungus.

In Europe and America the identity of *Puccinia graminis* is determined not merely by its morphological character, but from its ability to infect the barberry plant and produce æcidiospores. McAlpine contended that the *Puccinia graminis* of Australia must be biologically different from *Puccinia graminis* of Europe, because all efforts hitherto made to infect the barberry had failed.

Waterhouse, of the University School of Agriculture, Sydney, has, however, recently produced æcidiospores on the barberry from the telutospores of wheat. Waterhouse has also shown that there are two distinct biological forms of *Puccinia graminis* in Australia. Stakman, of Minnesota, has shown that no less than 38 distinct biological forms of *Puccinia* affect wheat in America. The production of varieties immune from rust is, therefore, much more difficult of accomplishment in the United States than in Australia.

In attempting the control of rust it is necessary to bear in mind, (1) how the rust continues from season to season, (2) how its injurious effects may be mitigated.

The uredospores produced in large numbers are distributed by the wind and are readily transported from one district to another.

The rust may be propagated on self-sown or volunteer wheat growing on headlands or in stubble paddocks. The system of harvesting practised in Australia results in the scattering of a certain amount of seed on the ground, and this germinates with the first rains and is almost always rusted.

Rust pustules can be obtained during the autumn and winter months upon the lower leaves of self-sown wheat and wheat under cultivation. The period elapsing between infection and maturity is usually nine days, i.e., from the time the fungus enters the plant until mature uredospores are produced.

Uredospores have been known to retain their vitality for 280 days. The fungus does not propagate by the mycelium entering the grain of wheat and beginning its life cycle with the germination of the grain. The infection comes from uredospores which find lodgment on the leaves. Hence pickling the seed is of no avail for the control of this disease.

Prevention of Rust.

The character of the weather in October and November largely determines the amount of damage done by rust. Prolonged moist, muggy, warm weather during the spring and early summer invariably means heavy losses through rust. To a certain extent its effects may be mitigated by sowing early and selecting early-maturing varieties. In this way it may be possible for the wheat to be well on to maturity before the muggy weather sets in. These varieties may mature before the effects of rust become pronounced.

Another difficulty is that wheats which resist rust in one country may succumb to it in another.

The most hopeful solution of the problem is the production of types of wheat which will be prolific and yet be relatively rust-resistant. It has been shown that no wheat is absolutely rust-proof, i.e., there is no known variety which will be proof against rust when grown under conditions favorable for its development. There are, however, many which, even in seasons favorable to rust, are only slightly affected.

The durum wheats are notably resistant as a class, but they do not yield well. Hence a possible solution is the cross-breeding of hardy, rust-resistant strains with prolific but susceptible varieties, with the object of producing a prolific rust-resistant type. If such a type of wheat can be produced by hybridisation or by selection, the discovery will add millions sterling to the national wealth of Australia.

The production of rust-resistant strains, combined with the sowing of early maturing varieties, and the adoption of the best agricultural methods, e.g., clean cultivation, judicious crop rotation, and rational manuring and fallowing, are the most likely methods of control.

(C) Insects Injurious to Stored Grain.

It is not proposed to deal with the various insect pests that attack growing wheat crops. These are described in French's "Destructive Insects of Victoria."

Fig. 33.—Wheat affected with Rust (Puccinia graminis.)

Fig. 34.—Group of Teluto Spores of Rust (Puccinia graminis.)

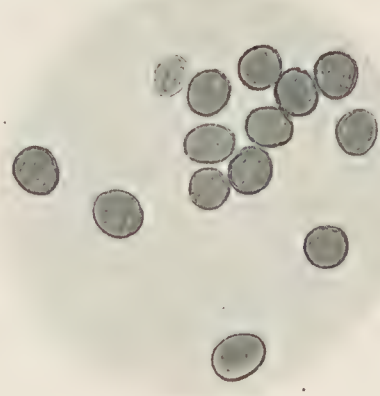
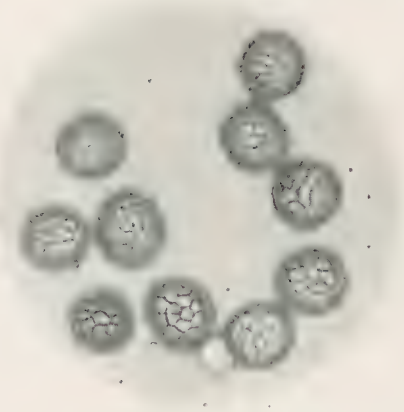


Fig. 35.—Group of Uredospores of Rust (P. graminis.)

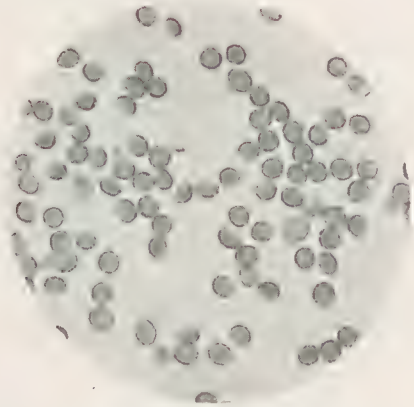
A. B.

A.—Bunt or Stinking Smut (Tilletia tritici).
B.—Loose Smut of Wheat (Ustilago tritici).



C.

C.—Spores of T. tritici.



D.

D.—Spores of Ustilago tritici.

Fig. 36.

Fig. 37.—Flag Smut of Wheat (Urocystis tritici).

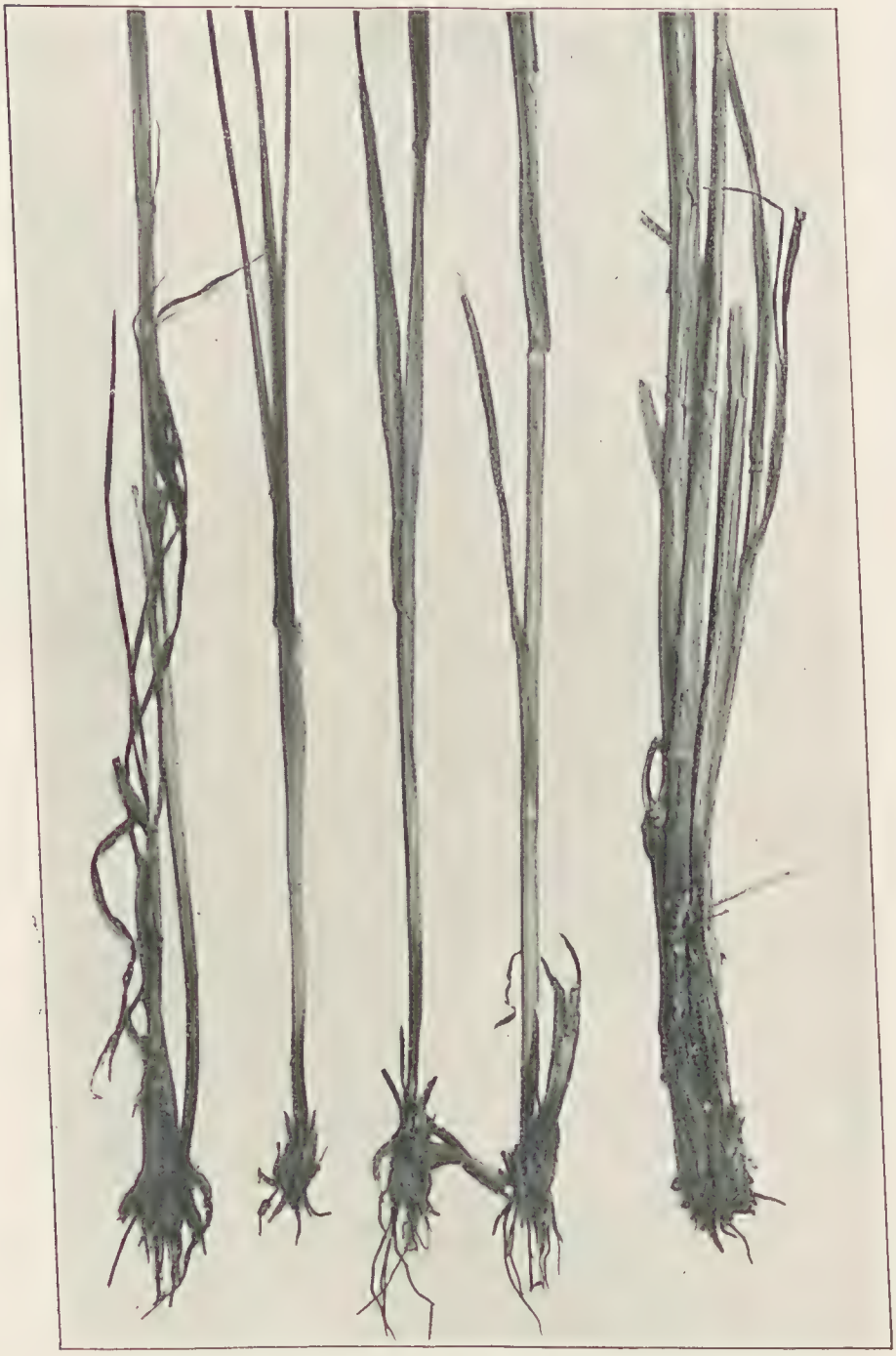


Fig. 38.—Wheat Plants affected with Take-all (Ophiobolus cariceti).

The pests affecting stored grain are so important to the wheat-grower that a brief account of the methods of control will be given. The most serious pests are the weevils. These caused immense damage to stored wheat in Australia throughout the war, because of the length of time the wheat had to be stored at shipping ports, country railway stations, and in farmers' barns. These are introduced pests. The most injurious are the grain weevils—*Calandra granaria* and *Calandra oryzae*. *Rhizopertha dominica* (the lesser grain borer) has also done considerable damage. *Calandra granaria* (the granary weevil), and *Calandra oryzae* (the rice weevil) are very similar, except that the latter is smaller than the former, and is winged. The life history from egg to the adult beetle varies from 19 to 22 days provided the temperature is favorable.

After the weevils have paired the female makes a hole in the grain of wheat with her rostrum, and deposits an egg in it. From the egg a larva emerges. During its growth this larva eats practically the entire contents of the grain, and changes to a pupa in the empty husk. Eventually the pupa changes to a perfect weevil, which eats its way out of the grain.

Methods of Control.—When wheat is harvested no weevils are found in the freshly-bagged grain. In fact, in most of the wheat harvested the moisture content of the grain is too low for weevil to multiply.

Weevils cannot multiply unless sufficient moisture is present in the grain. In experiments conducted by the Committee on Damage to Stored Grain (Institute of Science and Industry), it was shown that weevils were dormant in grain possessing less than 9 per cent. of moisture. When 10 per cent. of moisture was present the weevils bred, but required air to breed with normal rapidity. Wheat from the harvester generally contains 6-8 per cent. of moisture, so that weevils cannot live in freshly harvested wheat unless the grain absorbs sufficient moisture to bring the moisture content over 9 per cent. Infection of grain may take place—

(*a*) By placing new grain in weevil-infested bags.

(*b*) Storing new grain near weevily wheat.

(*c*) Using old dunnage from weevil-infested stacks.

(*d*) By weevils (*C. oryzae*) flying from grain stores, feed houses, &c.

Three methods of control have been used for weevils—(*a*) fumigation, (*b*) drying, (*c*) sterilization by heat.

Fumigation.—Fumigation with carbon-di-sulphide is entirely satisfactory for the destruction of live weevils. The eggs are not, however, destroyed. A second fumigation is therefore necessary to catch the weevils hatched out from the eggs. One pound of carbon-di-sulphide will fumigate 100 bushels of grain. The fumes of the carbon-di-sulphide need to be kept in contact with the grain for 20 hours at a temperature of over 60 deg. F.

Carbon-di-oxide is a most effective gas for fumigation of weevils when the compartments in which the grain is held are airtight. Fifteen cubic feet of gas will fumigate 1 ton of grain.

Dr. Hargreaves, of Adelaide, devised during the war a method of controlling weevils in large grain stacks. His method was to enclose the wheat stack with malthoid, and pump carbon dioxide and carbon monoxide gas into the enclosure. This kills the weevils, but the process needs to be repeated to catch weevils which hatch out from eggs.

Drying.—Weevils cannot multiply unless the moisture content of wheat exceeds 9 per cent. If stored at the seaboard, wheat readily absorbs moisture, and is very liable to weevil infection. In the United States the maize crop often contains too high a moisture content for storing in silos, and is therefore dried with mechanical driers prior to siloing. This drying may confer temporary immunity from weevil infestation.

Sterilization.—Maxwell Lefroy, who visited Australia in 1918, suggested sterilization as a possible means of controlling grain weevil. He showed that if weevily grain were heated to 140 deg. F. for three minutes all weevils and eggs were destroyed. This method has been extensively applied in Australia. A large percentage of the 1916-17 crop of Victoria and South Australia was treated in this way at a cost of about 2d. per bushel.

The experience of the Victorian Wheat Commission in connexion with the treatment of wheat for the Imperial Government has shown definitely that if proper precautions are taken losses through weevil may be reduced to a minimum.

OLD JOURNALS WANTED.

The Fisher Library of the Sydney University desires the following numbers of this *Journal*, which are out of print, to complete its files:—

Vol. I., 1902.—All but that for December.

Vol. II., 1903.—February, March, October, November, and December.

Vol. III., 1904.—November and December.

Indices for Vols. V. and VI. (1907 and 1908) are also desired.

If any of our readers have any of the numbers enumerated, and are willing to part with them, the Fisher Library authorities will be extremely glad to receive them.

SOME AMPELOGRAPHICAL NOTES.*

By F. de Castella, Government Viticulturist.

The subject I have selected for my address to-day is Ampelography. A vast subject and one which, in Australia, is on a most unsatisfactory footing. Some of our standard varieties are, no doubt, true to name—at any rate to the names by which they have become generally known in Australian vineyards—names which, it may be noted, have not always been quite judiciously chosen; but as regards a great many of our vines confusion is very rife. We sometimes find a certain sort to be called by different names in different States or even in different districts of the same State. It not infrequently happens that these local names are hopelessly incorrect. In other cases we find totally distinct sorts passing under the same name in different districts. In other cases again we find sorts which have lost their identity altogether. Some of these, which are obviously of value owing to their fruit bearing capacity or some other quality, are only to be found as isolated vines mixed in a block planted mainly with some better known sort. Many of these "strangers" are worth multiplying and planting on a large scale—nearly all are worthy of study and identification. A few examples may be given. Semillon, the standard Sauternes variety, is known in New South Wales as Hunter River Riesling and as Shepherd's Riesling; in Victoria, as Shepherd's Riesling, Pinot Blanc and White Ivanhoe; and in South Australia as White Madeira and Bastard Pinot. As an example of distinct sorts being given the same name, we have the name White Hermitage, which at Rutherglen and also at Auldana is applied to the Uni Blanc of Southern France, whilst in the Lilydale vineyards it is given to Marsanne, one of the leading white sorts grown in the Rhone Valley, an altogether distinct grape Likewise the name Pedro; though this is correctly applied in most South Australian vineyards, it is, in North-East Victoria, given to a vine in no way resembling true Pedro. A more tangled case still is to be found in connexion with Cinsaut or Blue Imperial, which at Rutherglen is usually called Black Hamburg, and at Great Western Black Prince, notwithstanding the fact that the three sorts are so distinct from each other that confusion should be impossible.

Sometimes we find a vine known by a local name which quite obscures its origin, and has no connexion with its generally accepted name in other countries. Aramon, for example, is known as Fontainebleau in Western Australia.

What is the correct name of a vine? Even in old Europe many popular sorts have several synonyms. Our Mataro for example. In France the name now generally looked upon as correct is Mourvedre; it is only in the Department of Pyrenees Orientales, where the Franco-Spanish frontier meets the Mediterranean, that it is known as Mataro, the name we have almost universally adopted in Australia. In many other French districts it is called Espart, whilst in Cognac, where it is largely grown for brandy it is called Balzac. In France the confusion which existed some decades back has been in large measure rectified and to each sort a standard name has been assigned. The complexity of the question is not astonishing in view of the enormous number of distinct vine varieties. *Ampelographie*, the standard work by Viala

*Paper read at the fifth Inter-State Wine Congress, Adelaide, June, 1924.

and Vermorel, describes no less than 5,200 distinct sorts under 26,000 synonyms.

What's in a name? may say some: wouldn't a rose by any other name smell as sweet? Possibly. Nevertheless the importance of calling our vines by correct names must appeal to all. With table grapes, which are largely sold by auction, uniform nomenclature is obviously desirable to avoid confusion.

Though perhaps less vital for wine grapes, it is at least highly desirable. Unless the wine-maker knows what vines he is dealing with, he is working in the dark; the wine literature of the old world is a sealed book to him. Knowledge of its previous record is as useful in connexion with a vine as with a new employee or a racehorse; unless we know its name how can we look up its record. How can the intending planter plot out his vineyard and order his vines. This difficulty cropped up during the Rutherglen reconstitution. Growers desiring to plant Rutherglen White Hermitage had to order Uni Blanc and not Marsanne, which is the true White Hermitage, but which would have proved a totally different sort to what they wanted.

In the present paper I propose to briefly resume the more striking facts which came under my notice during a very pleasant though too short visit spent among your South Australian vineyards early last year, at the invitation of the South Australia Vine Growers' Association. I hope that these few notes may do something towards enlisting the interest of our vine-growers in the fascinating study of Ampelography. My visit occupied five days during which I received valuable assistance at every vineyard I visited. I must particularly thank Messrs. L. Salter, G. and D. Quinn, G. R. Gurner, R. Buring, Sobels, R. Martin and F. Kay, who accompanied me on one or more of the different excursions. On 21st January, 1923, Mr. Quinn's interesting Hackney collection of vines was inspected; the 22nd was spent at Oaklands, Marion, Happy Valley, Reynella and Clarendon. The 23rd at Spring Vale and Seven Hills; the 24th at Clare, Angaston and Pewsey Vale; and the 25th among vineyards near Adelaide—Messrs. Marks Bros., Greenham, Sparkling Wines Ltd. and Auldana.

Space will not permit a detailed description of all the interesting vine sorts which were brought under my notice. I shall, therefore, confine myself to brief remarks concerning a few which seem to me of more immediate practical interest.

Among the places which I found most interesting from an ampelographical stand-point, special mention may be made of the following:—The interesting Hackney collection, where Mr. Quinn has grouped 78 distinct vine varieties which should prove of great value for identification and demonstration purposes. At Clarendon vineyard there is a large number of different varieties which would well repay careful study. Unfortunately we were only able to spend an hour in this interesting and very picturesque old vineyard. At Spring Vale, there was also much of interest to be seen, especially a block of mixed vines which were the pick of the best rootlings from a nursery of struck cuttings selected from the Botanical Gardens collection, by the late Thos. Hardy; many other sorts were also noticed well worthy of more detailed study than our brief visit and the high temperature (107 degrees in the shade) would permit.

I was particularly interested, in a couple of American vines (hybrids) which I saw at Spring Vale. One in particular seems to show great

promise as a resistant stock; it is a remarkably vigorous vine. Judging by the leaves and the ribbed canes it should be a Berlandieri hybrid. Seeing the great value of many stocks of this breeding, this vine is well worth further study. Messrs. Buring and Sobels have kindly supplied me with a good number of cuttings, these are being struck in our nurseries and the vine will be thoroughly tested at our Rutherglen Viticultural Station.

Seven Hills also promised a fruitful field, a considerable number of distinct sorts were met with, some of them being old acquaintances under unusual names. I much regretted that owing to Mr. Sidney Smith's absence we could not visit the collection of different varieties at Yalumba, Angaston, which should prove most interesting. I understand that it constitutes a link with the importations made by Jas. Busby, in 1832 on his return from the visit he made to Spain and France in the interests of Australian Viticulture. He published a journal of his visit in 1840. I secured a copy of this journal in a second-hand book-shop in 1910, and was rather surprised to find that Busby had visited and reported on several of the Spanish and French vine districts I was privileged to visit in carrying out the mission with which I was entrusted by the Victorian Government in 1907-8. I also found that Busby had imported many of the vines I brought out with me in 1908, most of which I thought to be new to Australia. It would appear that many of the sorts introduced by Busby failed to attract the attention they merited and to be propagated and planted on a large scale. Probably odd lots of cuttings of those which showed most promise were given at different times to interested growers. Such sorts have thus found their way, in the shape of odd individual vines, into blocks planted with other sorts. I hope at some future date to visit this collection at Yalumba.

Pewsey Vale I visited with great interest. We all deplore the loss of the owner of this unique vineyard where the oldest vines were planted 85 years ago. At Pewsey Vale the number of varieties grown is limited to three: Cabernet Sauvignon, Riesling, and Red Hermitage. A good many sorts were originally planted, the cuttings coming from Macarthur's of Camden, New South Wales, but all varieties other than the three above named ones, were gradually eliminated.

These brief allusions to McArthur and Busby take one's thoughts back to the infancy of Australian Viticulture and suggest how desirable it is that all facts concerning its early development should be collected and placed on permanent record ere it is too late. Historical considerations, however, though allied to ampelography do not really come within the scope of the present paper.

With these few introductory remarks, I propose to briefly deal with the vine varieties investigated, taking them in the order of their importance and designating them by the name usually given them in South Australia. The opinions I expressed must not be taken as final. They are merely impressions rapidly formed in the necessarily hurried inspection of a vast number of different vines. I hope they may serve as suggestions for further investigations and not as final decisions.

Shiraz or Red Hermitage.—This grape, which enters so largely into our shipments to London, and also into our wines of port type, is certainly the red grape exclusively grown in the Hermitage district of France, yielding the high class wine for which this small district, on the left bank of the Rhone, is so well and favorably known. Both the names by which we know it here are undesirable. The former is

incorrect, and misleading, the latter is the name of a district and not of a vine sort.

The recognized name of this grape in France is Syrah or, as it is sometimes spelt Syrrah. Local names, which no doubt originated among illiterate vine dressers some centuries ago, naturally vary considerably in spelling and the grape in question is sometimes called Sirac or Syrac and schiras. Busby, in describing his visit to Hermitage, calls it Ciras. or Scyras. Foex who describes it under the name Syra gives Schiras as one of the synonyms. In California it is generally known as petite Syrah. The designation Shiraz is, of course, based on the legend, since proved to be entirely mythical, that the vine was introduced from Persia by the hermit who first planted the vine on the Hermitage Hill. This hermit, who was a particularly gay young German Knight at the French Court, by name Henri Gaspard de Sterimberg, was so disgusted by the scenes of carnage at which he assisted in the crusade against the Albigeois, under Simon de Montfort in 1224, that he decided to retire from the world. He asked Queen Blanche de Castille, mother of St. Louis, for a piece of land on which to establish a hermitage. The queen, touched by the piety of the repentant Knight, gave him a letter to St. André le Bas, Governor of the province of Dauphiné, from whom he received the life interest in a small corner of land adjoining the Chapel of St. Christofle. Here he built a hut, cleared two patches of the hill then covered in oak scrub and planted vines. The excellence of the wine produced soon led to the whole hill being cleared and planted with vines. But to return to the origin of the name Syrah. In addition to the Persian legend there are others; that this sort originated in the Island of Syrah, one of the Cyclades; that it came from Syracuse whence the variation Syrac mentioned above. It is now generally admitted that the vine is indigenous to the region where it is found to-day, and that it has absolutely nothing to do with Shiraz in Persia, the Cyclades or Syracuse. In neither of these does any vine grow to-day in any way resembling the Syrah of Hermitage. I trust I may be pardoned this digression.

Cabernet Sauvignon is really the sort grown under this name in the Bordeaux district, or one of them, since there are several variations of Cabernet.

Cabernet Gros as you call it here, has nothing in common with the French vine of this name. I came across two distinct vines under the name of Cabernet Gros in South Australia, one of these, which I saw on a previous visit at Mr. Kappler's vineyard, in the Barossa district in 1920, seems to be the Merlot of Medoc. The other, which I saw at Clare, in Mr. Knapstein's vineyard, is quite distinct from Merlot; at first sight it reminds one rather of Grenache, though it is really distinct. It has nothing whatever in common with the French Cabernet Gros.

Grenache is the true Grenache or Alicante of Southern France and particularly of Rousillon, identical with the Garnarcho of North-Eastern Spain; the sort so much appreciated for its heavy yield and rapid maturation, when made into a sweet wine. Few wines develop a tawny color and a *Rancio* or porty character so quickly as Grenache.

Mataro.—This seems to be the same sort we grow under this name in Victoria. It is easy for confusion to arise between Mataro and the true Morrastel, the two being very similar. Indeed, I think it quite possible that many of the vines we grow as Mataro are really Morrastel.

The following are the main differences between the two sorts. Both are very erect growers, but Mataro more so than Morrastel. The leaves of Morrastel are a somewhat lighter green on the upper side and have rather less cotton on the under side, the canes are darker and redder than Mataro. Morrastel has a smaller berry and ripens a few days earlier. The most striking difference between these brothers is when the vines first sprout, in spring. The bursting buds of Morrastel have young leaves of a russet bronze or even brick red colour, whereas a thick white felt covers those of Mataro, which are tinted with salmon pink. Morrastel does better on dry hill sides, where it bears good crops and stands dry conditions well. On rich, moist soil it grows too much wood at the expense of fruit, the blossom often setting badly. Mataro, on the other hand, is the heavier bearer on rich land.

Pedro.—Your South Australian Pedro is the true Pedro Ximenez or Jimines of Southern Spain. In North-Eastern Victoria we have long grown under the name of Pedro, a sort absolutely distinct from the true Spanish grape, yielding a wine of considerable character and quality. To avoid confusion we now describe this sort as Rutherglen Pedro. What it really is I have not yet been able to ascertain. At Roseworthy I was shown a vine named Don Pedro which though in some ways resembling our Rutherglen Pedro, is quite distinct from it. The true Pedro Ximenez is a valuable sort, the real worth of which is appreciated in your State. The value of this sort is further evidenced by the considerable range of country in Spain where it is largely grown—always a proof of value in a vine variety. Though often called the true sherry grape, it scarcely merits this title. Palomino is far more widely grown than Pedro for the production of sherry, though the latter is certainly grown to some extent at Jerez, it is mainly made into sweet wine. At Montilla, about 100 miles from Jerez, where wines of true sherry type are also made, Pedro Ximenez is much more extensively grown. This vine recalls the story of yet another viticultural myth. When in Spain I was informed by one of the leading wine men of Jerez, that Pedro Ximenez was identical with Rhine Riesling—that this variety was, in fact, imported from Germany to Spain by one Peter Siemen, and that the name became in Spanish Pedro Ximenez—a pretty story, no doubt, which is, however, discounted by the fact that Pedro and Riesling are radically different sorts, as I told my informant to his great surprise. These two samples of "myths" will serve to further show how much confusion there is in matters ampelographical and how cautious one must be about taking assertions for granted. In the Hackney collection I saw under the name of Pedro Ximenez a grape which is certainly not the true vine of this name. The berry was much larger; it seems in fact quite a fair table grape which the true Pedro is not.

Sweet-water and Palomino.—Here we have another example of the confusion which is so rife in our vine names. The grape which has been grown for so long in Australia under the name of sweet-water turns out to be none other than the true Palomino of Jerez, also known in Spain by the name Listan, the leading sherry sort in fact, whilst the grape you grow in South Australia under the name of Palomino Blanco is not Palomino at all. For convenience sake and until its true name can be ascertained we had better call it South Australian Palomino. I had long suspected, after careful study of descriptions of the Spanish sort, that sweet-water and Palomino were one and the same grape.

The idea was first put into my head by Dr. Kelly who in *The Vine in Australia* described Palomino as a vine resembling sweet-water. The idea received further support when I saw the Palomino in Jerez in 1907, though it was late in the season and most of the leaves had fallen from the vines. Absolute confirmation followed later, when importations on a large scale of Spanish Palomino proved absolutely identical with the old sweet-water, a vine which was, I think, grown more extensively in Victoria than in this State, though you also grow it, since I met it in the Hackney collection and at Spring Vale. Strange to say we usually looked down on it as an inferior sort, though I have known some excellent wine to be made from it. Palomino must have been brought to the south of England centuries ago by sailors engaged in the sherry trade. "Sherris sack" as Shakespear made Falstaff call it. Palomino being one of the earliest Jerez grapes, was no doubt the only one which would ripen in the open air in the south of England. For want of a better name and having forgotten its Spanish one, it was popularly termed sweet-water.

What your South Australian Palomino really is I am quite unable to say. I have been able to study the vine at the Rutherglen Viticultural Station through cuttings kindly supplied to me by Mr. Laffer. It is quite unlike any other of the 300 odd varieties we grow. It is a sort of value, being a heavy bearer and yielding quite a good wine.

White and Red Madeira.—I was particularly interested in these two vines which I came across in several vineyards. The white sort seems to me identical with the Semillon of Sauternes, &c., in France, one of the finest white grapes grown anywhere, a grape which has been unfortunate with us so far as correct naming is concerned, wherever grown it has passed under a wrong name. In Victoria, it is often termed Pinot or White Pinot and also White Ivanhoe in some vineyards owing to its having been planted extensively in Maplestone's vineyard at Ivanhoe, near Melbourne, a vineyard long since rooted out to make way for suburban extension, but which turned out some beautiful wines when I was a small boy.

On the Hunter this vine is known as Hunter River Riesling and Shepherd's Riesling. I was informed in Sydney that the last name is a corruption of "Shepherd's seedling" under which it was put on the market from Shepherd & Sons, Double Bay Nursery near Sydney. It is no locally raised seedling however. It is far more likely that Mr. Shepherd noticed in a collection, some odd vines, the original names of which had been lost, but which he thought worth multiplying and putting on the market. The name Shepherd's Riesling is still given to it in some Victorian vineyards. Semillon was certainly introduced by Busby in 1832; it is No. 60 of his first catalogue (importations from France). It is indeed strange that a vine with such a reputation should not have been multiplied under its true name. It was only after importations from France in the nineties that the identity of the Hunter River Riesling and Semillon was established.

Your White Madeira seems to me absolutely identical with Semillon. The only point which might suggest a doubt is the frequent presence of a red variation, side by side, with the white; a grape in every way identical except for its light red colour. Now I know of no red Semillon. With many sorts, colour variations are frequent, but there is no mention of a red variation in any description of Semillon I have come across.

I hope to graft some cuttings of this vine at Rutherglen side by side with authentic Semillon from France, and I shall be much astonished if they do not prove identical. We first saw your White Madeira at Messrs. Wickham & Candy's, Happy Valley, and I was immediately struck by its strong resemblance to Semillon. We met the same vine (red and white) at Reynella, at Spring Vale, and at Seven Hills, where it was called Tokay, and at Sparkling Wines Ltd., where it passed as Bastard Pinot; here a block of about an acre is planted with it unmixed with the red variation.

Tokay.—The vine grown in South Australia under this name is the same as our Victorian Tokay, a vine quite distinct from Furmint, the leading Tokay sort. I am not absolutely certain as to what our Tokay really is, but think it is one of the other varieties, largely cultivated at Tokay (Hegy-Alya) Hungary, known as Harslevelu, which means lime or linden-leaf—referring to the distinctly three lobed leaf of this vine.

Riesling.—In many South Australian vineyards the grape grown under this name is the true Rhine Riesling. There is no mistaking the wine made from it at Spring Vale (Quellthaler) and Pewsey Vale. The Riesling in the Hackney collection is correctly named. We also found it at Messrs. Wickham & Candy and at Hectorville. To my great astonishment I came across two other sorts grown under this name, one, at least, of which I have no hesitation in describing as a Riesling in name only. For want of a better name, we may temporarily term it Clare Riesling. I first found it at Seven Hills. On tasting a wine, said to be a Riesling, I commented on the absence of the characteristic bouquet and flavour of this sort, which was explained when Brother Boehmer showed me the vine from which it was made. He informed me that the cuttings came from Mr. Knapstein's vineyard. It seems a desirable sort being a strong, rather erect grower and a good bearer, yielding an excellent though rather neutral wine. I was not able to identify it, but it certainly is not Riesling. On the following day we again found this vine at one of Mr. Knapstein's vineyards, where he grows a certain area of it in addition to the true Rhine Riesling. It seems to me that this so called Riesling may be the Colombar which was rather a favorite in California under the name of Green Sauvignon. The green appearance of the grapes even when quite ripe, would seem to confirm this view. I hope to graft a few cuttings at our Rutherglen Viticultural Station for comparison with the true Colombar.

A third type of Riesling was described to me by Mr. F. Kay, in some ways like the Rhine Riesling, but a better bearer especially on dry hill-sides, and with an oval berry. The wine it yields is of characteristic Riesling-like bouquet. I hope to get some cuttings of this sort for further study.

Temprano.—This sort, which I met with often, seems to be grown fairly extensively in your State. I have also seen it in Victoria under the name of White Syrian and other equally incorrect names. I am in the dark as to its real name. "Temprano", in Spanish, merely signifies "early" which is too vague to constitute a satisfactory vine name. Possibly, it was merely the adjective qualifying the true name of the vine, which has been lost. Busby imported from Spain in 1832, a vine under the name of Temprana (No. 16 of his Spanish catalogue). He states, however, that "Roxas Clemente identifies this variety as the

same with the common Listan and the White Palomino of Xeres" (Listan and Palomino are synonyms). In other words our sweet-water. Now, as you are aware, your Temprano is altogether distinct from Palomino or sweet-water. This gives us little help, but will serve as an example of the puzzles which continually crop up in connexion with vine identification.

Black Portugal.—This is the same vine which is erroneously called Mataro at Great Western. What it is I have not yet been able to ascertain. It is not one of the true port sorts and possibly is not of Portuguese origin at all. It is a hardy vine and a good bearer and seems worthy of further trial as regards the quality of its wine.

Espanoir or Verdal.—This seems to be the southern French Aspiran. No doubt the first name is a corruption of Aspiran Noir under which name it was probably imported. There are three colour variations of this vine; the name Verdal is usually applied to the intermediate or rose coloured one. Aspiran is a valuable sort, a good bearer, yielding a wine of quality which shows much refinement though very light in colour. It is this lack of colour which has militated against its plantations on a large scale. It is looked upon as a quality sort near Montpellier. Blended with Shiraz to increase the colour it should be admirably adapted for the production of light, rapidly maturing beverage wines.

Red Malaga.—I met this vine in many vineyards and recognized it by its peculiar, almost fig-like leaf It was in the Clare district that I was informed of the above name. What the vine really is I do not know. It is of reddish black, rather uneven color and a good cropper. Names of this kind are lacking in definiteness and recall a story I recently heard from Western Australila. The Agricultural Department of that State, at the request of a grower, wrote to the British Consul in Malaga, asking him to secure and forward cuttings of the black Malaga variety. The Consul replied that many black varieties were grown near Malaga and asked which particular one was required.

Table Grapes.—Though wine sorts were the object of my visit I was also interested in several table grapes I met with. *Belas, Blanco* which I saw at the Hackney collection (No. 41) and in several vineyards is identical with Valensy or Valensi, so largely grown for shipment, at Jijona in South-Eastern Spain. I established this identity some years ago at our Viticultural Station, by comparing Valensy imported from France with Belas Blanco from Mildura, the original cutting of which came from South Australia.

Grand Turk is identical with the vine we have long called Black St. Peter in Victoria, but the correct name of which is Danugue or Gros Guillaume, an excellent vine to cover a very large trellis and yielding quite a good black table grape.

Your *White Malaga* is what we call Waltham Cross in Victoria, a vine of which the true name is Rosaki, and which has been grown for centuries in Anatolia and other parts of Asia Minor. It is from this grape that the Eleme raisins are made. Hogg says of this vine, "It was introduced by Mr. William Paul of Waltham Cross, and received a first class certificate from the Royal Horticultural Society in 1871." It seems a pity that Mr. Paul should have departed from the original name Rosaki, by which it is known in California.

Centennial is a sport of Rosaki which originated in Bendigo (Vic.). I saw some Centennial vines in the Hackney collection. You are to be sincerely congratulated in having escaped Phylloxera when you introduced this vine. Probably cuttings only were brought over; it is very unusual for phylloxera to be introduced with cuttings. Rooted vines of this sort, sent out from Bendigo before Phylloxera was officially reported there, are responsible for the introduction of Phylloxera into several districts in Victoria.

Such is a necessarily brief report on my visit to South Australia last year. These notes deal with only a few of the numerous sorts which came under my notice. I thought it well to limit my remarks to-day to sorts concerning which some fairly definite conclusions could be arrived at. There are many others, well worth further investigation. Some of these have not even a local name by which they could be referred to provisionally.

May I, in conclusion, reiterate the desirability, which I pointed out a year ago in Sydney, of re-instituting the inter-State Ampelographical Committee appointed in 1919, but which lapsed, after a couple of meetings, owing to Messrs. Laffer (New South Wales) and Mowat (South Australia) resigning from the services of their respective States. The work is too vast for one man to undertake single-handed and greater authority attaches to the collective wisdom of a committee. It would give me great pleasure to assist in any way in my power, and I hope arrangements may be made to utilize our Rutherglen Viticultural Station for vine identification purposes.

Type vines cannot be sent to you from Rutherglen, but there is nothing to prevent our obtaining South Australian cuttings and grafting them on established stocks, thus causing them to fruit within eighteen months. I do not say we can identify all vines, for our collection only comprises a little over 300 sorts, but some of your "strangers" are likely to prove identical with one or other of our recent introductions.

I beg to further suggest the publication at an early date of a comprehensive list with brief descriptions, of all vines grown in Australia—something after the style of the catalogue issued in 1922 by the State of California Department of Agriculture and jointly compiled by the Bureau of Standardization and the Viticultural service.

STORING MANGELS.

A correspondent asks the best way to keep mangels after they have been lifted.

The reply is:—They may be stored on a well-drained spot in the field in heaps from five to seven feet high. A layer of straw should be placed over the heaps, which should then be covered with earth.

A better plan is to put the mangels, when thoroughly dry, into a cellar or shed where a fairly even temperature will be maintained.

POULTRY PARASITES

By H. F. Clinton.

External and Internal Parasites.

Domestic poultry are frequently infested with parasites belonging to different species, such as lice, mites, ticks and worms, which by their

Common Louse of the Fowl. Magnified 37 times.

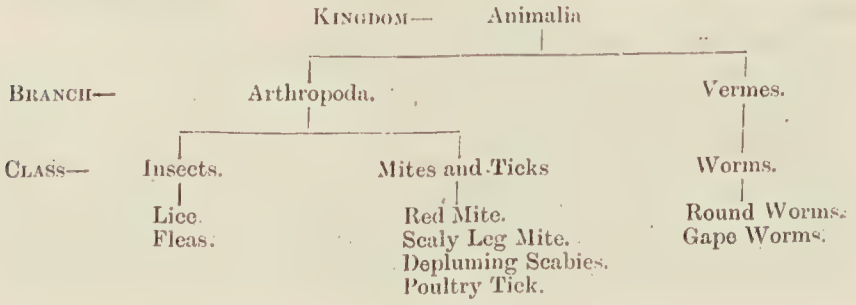
Stickfast Flea.

increasing numbers and by the effects of irritation cause considerable discomfort to their unfortunate hosts. Chickens so affected mature slowly and become liable to many ailments.

Laying hens grow thin, their egg production is reduced considerably, and the flesh of table birds becomes poor in quality. There is also every possibility of the parasites carrying and distributing disease-producing organisms. Examination of the birds themselves and also of the sheds for vermin is too often neglected, and the cause of the unhealthy condition of fowls is often not ascertained until after considerable loss has occurred. Prevention is always better than cure, and constant attention and cleanliness are the only means of keeping vermin in check. Houses can be regularly sprayed with kerosene emulsion, carbolic solution, or chloride of lime, and nests, perches, &c., frequently examined and treated.

Red Mite. (Magnified 38 times.)

Some general details are given below regarding those specimens more generally met with in domestic poultry. They are separated into divisions as follows:—



Lice (Mallophaga).

Unlike the red mite and tick, lice live permanently on their hosts. Occasionally they may be seen on the roosts and in the nest boxes, but if they do not return to the bird they will die in a couple of days for want of nourishment and warmth. They have mouth-parts adapted for biting and chewing the surface of the skin or feathers and do not suck blood like the mites and ticks. Sometimes they may be found to contain blood, but this is a mere chance, the blood having been obtained from a young feather or by biting a tender part of the skin.

Lice do not go through a complete change of form like a butterfly or moth. Eggs are laid on the feathers of any poultry, and in from seven to ten days the young emerge. They are similar in appearance to the adult, but very small. The period required for full development from the time the egg is laid is from sixteen to twenty days. Breathing takes place through spiracles or small holes in the body of the insect

Scaly-leg Mite. (Magnified 100 times.)

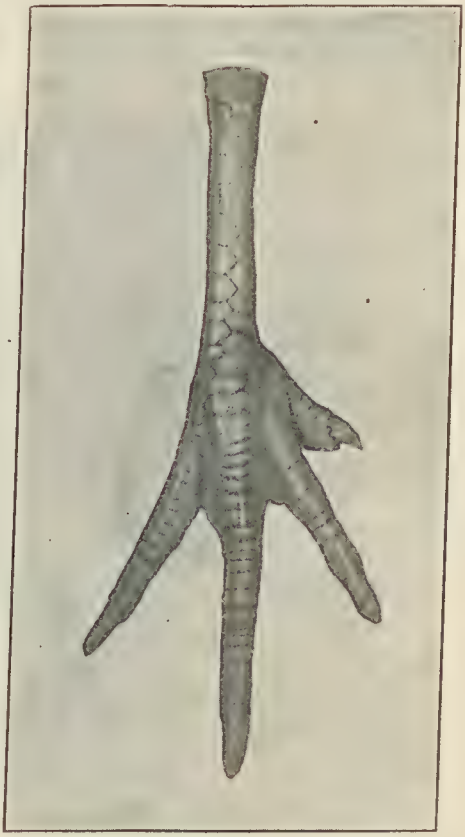
and not through the mouth. Under the microscope respiratory or breathing tubes can be seen connected to these holes all through the body.

There are about twenty different species of lice found on domesticated poultry, and with the exception of the head louse, all can be treated in the same way. But it should always be remembered that prevention is better than cure. A dust-bath must be provided for the birds. A portion of the shed or yard should be boarded up about a foot high and supplied with fine dust. The addition of wood ashes and sand will keep the dust-bath loose; flowers of sulphur is often recommended to be added in addition. Individual birds that are badly infested may be dusted with a good insect powder. The head-louse of chickens and fowls causes a great deal of trouble at times. The best treatment for this is to give any affected bird a dressing of castor oil or vaseline.

Fleas.

Amongst these pests, the "Stickfast" flea is the most troublesome; fortunately it has not yet been recorded in Victoria, though it made its appearance in Western Australia, where it has proved a source of worry to the poultry keeper. In addition to poultry, it attacks wild birds, cats, dogs, and horses. Its effect on chickens is very severe, and mortality as high as 85 per cent. has been reported in some countries. The importation of poultry into Victoria from Western Australia is prohibited on account of this pest.

Shank and Foot of Fowl affected with Scaly-leg Mite.



Healthy Shank and Foot of Fowl.

"Stickfast" fleas are blood-sucking insects, and they attach themselves in considerable numbers to the comb, wattles, and lobes, and around the eyes, hence the name "Stickfast." During its life this insect undergoes a complete change of form. The adult fleas sometimes lay their eggs on the ground, or they may lay them whilst on the bird, but the eggs are not glued to the feathers in the same way as the eggs of the louse. Small grubs hatch from the eggs and feed on the organic matter in the soil, and when they grow to maturity burrow from 3 to 6 inches into the ground to spin their cocoons. Finally,

from this chrysalis stage the full-grown insect emerges. The period necessary for its full development varies, according to weather conditions, from four to six weeks. Some of these insects will live as long as twelve months.

To eradicate these fleas it would be necessary to clean out the houses and yards well and spray the ground so as to destroy the grubs and eggs. For treating the birds, castor oil or vaseline, which are non-irritants, are about the best to apply direct to the fleas on the birds: care should be taken to see that the insects are well covered with the preparation so as to stop up their breathing spiracles. Buyers should be careful when buying poultry that they do not purchase from infected yards, and as a further precaution all birds should be carefully examined before being liberated.

Red Mite.

This is a very common poultry pest. When full grown, it is about one-sixteenth of an inch long; it can be very easily distinguished from

A *B*

Poultry Tick. (Magnified 4¼ times.)

A Under side. *B* Upper side.

the louse. The head, thorax, and abdomen are fused into one piece. In the adult stage the red mite has four pairs of legs. The mouth-parts are adapted for piercing and sucking, and the insect's only food is the blood of the bird. These mites attack the birds at night and remain during the day-time in cracks and crevices of the perches, nests, and houses. They cause the birds considerable irritation and consequent loss of sleep. The red mites lay their eggs in their hiding places; they hatch out in from five to seven days. Although not hard to kill, great difficulty is often experienced in getting at the mites' hiding places, consequently sheds and perches should be as free from cracks as possible. Spraying should be well done with a good penetrating fine mist spray; chloride of lime, from 6 to 8 oz. to the gallon, is suitable for the purpose. There is nothing better than kerosene for painting the roosts, and at intervals the joinings of the uprights and perches should be painted with kerosene.

Scaly-leg Mite.

These are very small mites, each measuring about 1-100th of an inch long. They live and will multiply rapidly under the scales of the legs and feet of birds. They burrow under the scales and cast out the debris; rough crusts are formed and gradually the feet present a deformed appearance which, if neglected, will ultimately cause lameness. The mites are readily transferred from one bird to another, and prompt treatment is imperative. The crusts may be softened by soaking in warm soapy water, and the dirt removed by scrubbing with a nail brush, care being taken that bleeding does not occur. An ointment consisting of sulphur and fat, kerosene and fat, or carbolized vaseline should then be applied, and the treatment repeated in a week's time. This should effect a gradual cure.

Round Worms Protruding from the Intestine of a Fowl.

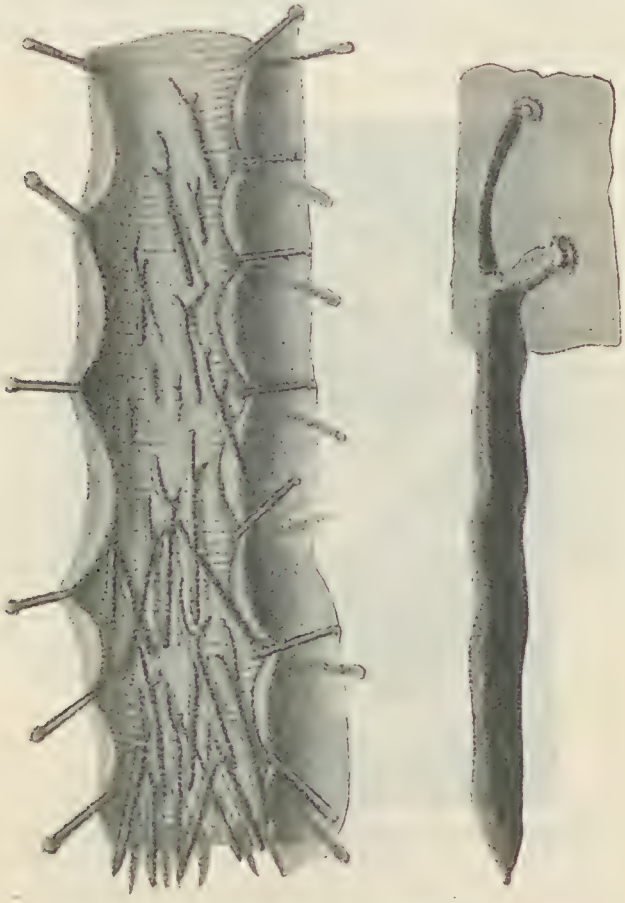
Depluming Scabies.

Sometimes the feathers will fall off the breast and other parts of domestic birds. This is very often caused by a mite smaller than the scaly-leg mite, measuring about 1-150th of an inch long. Affected birds should be isolated and given a dressing of sulphur ointment around the affected parts and also a little distance inwards from the bare part, where the feathers are.

Poultry Tick.

This pest hides in the crevices and cracks of the houses and perches during the day-time, and visits the birds at night. These ticks, like

the red mites, are blood-suckers. There should be no difficulty in distinguishing the two species, the poultry tick being so much the larger. Ticks may be found in all stages from the small six-legged larva up to the adult tick with eight legs. They are oval in shape, flattened with thin margins, pitted on the dorsal surface and greyish-blue in colour. They have no eyes. The eggs are laid in the crevices of the houses and perches, and often on the bird itself. Poultry tick is very tenacious of life, and have been known to live three or four years without food. A knife or chisel thrust into the crevices of an infested



Gape Worms. (Magnified.)

Wind-pipe pinned open, showing worms attached.

shed will come out smeared with blood. The Quarantine Act requires that all outbreaks be reported to the Chief Veterinary Officer, Department of Agriculture.

In tick-infested areas all houses should be of iron, with the woodwork on the outside if possible, and should be built away from any other structure. Pepper trees have been found to harbor large numbers of the pests.

Poultry tick is responsible for the disease known as tick fever. In biting the fowl they introduce a blood organism called a spirochaete. The organisms multiply very rapidly in the blood of the bird and their excreta decomposes the blood and causes it to rise to a high temperature.

Round Worms.

These are very hard to get rid of, and prevention should always be aimed at. More than ordinary care must be taken to clean up the excreta of the birds. The eggs are laid in the gizzard and intestines, and some of them pass out of the bird to the ground. Other birds pick up the eggs and become affected. The ground should be sprayed with a solution of chloride of lime, from 4 to 6 ozs. to the gallon of water. Feed onions in the mash to the amount of three-quarters of an ounce to the adult fowl three times a week; give the chickens as much raw onion with the green food as they will eat. Give Epsom salts to the adult birds at the rate of a 1-oz. packet to twelve birds, and to chickens at the rate of about 1 oz. to twenty birds, varying the quantity according to their age; carry this out on two occasions at an interval of three days.

Gape Worms.

The gape worm, or as it is sometimes called, a Y or forked worm, are from about one-half to one inch in length. They attach themselves to the mucous membrane of the wind-pipe of the bird and suck blood. The bird is noticed to open its mouth frequently and gasp for air. A feather dipped in turpentine and pushed down the wind-pipe and turned around a few times will destroy some of the worms, or flowers of sulphur may be blown into the birds' throat with the aid of a quill. But, once again, it must be emphasized that prevention is better than cure. Treatment similar to that for round worms will help to remove the cause.

CHILDREN AND THE FOOD VALUE OF MILK.

From experiments carried out under the supervision of the medical officer of the Birmingham educational authority, a very instructive demonstration of the nutritive value of fresh milk has resulted. Thirty children of both sexes, aged from seven to eleven years, selected from the scholars of a council school, were given an additional daily ration of a pint of milk. After four months it was found by medical examination and ordinary observation that a rapid and notable improvement in physical and mental vigour, with an accelerated increase of weight, had occurred. The discontinuance of this addition to the children's dietary led within a month to a marked cessation of progress, a conclusive confirmation of the positive results of the four months' experiment. The value of pure fresh milk and the need for a much greater consumption in the country are constantly receiving such testimony. Milk supply, like housing, forms one of the most pressing social questions confronting the nation. Within the administrative functions of the Ministry of Health and Board of Education there is much scope for concerted action to secure the fullest possible use of this food so essential for the national well-being.

—Reprinted from *The Dairy*, 18th August, 1923.

MINERAL MATTER IN CATTLE FOODS.

A. J. Gill, Dairy Supervisor.

Whether heavy feeding and forcing weakens the constitution and causes the cow to break down is a question frequently discussed. After having closely studied the feeding of cows under test for several years, I have come to the conclusion that there is no danger of a cow sickening or breaking down as long as she is fed judiciously. In some herds cows sixteen and seventeen years old are still milking well, but in other cases, where the breeders, while supplying sufficient protein and carbo-hydrates, have entirely neglected the mineral matter, the results have been disappointing. In a case that came under my notice a heavy milking cow, after having been tested for some years, had to be assisted to rise every morning. In another, a cow which was sickening frequently, and refusing to eat concentrates, and milking poorly, made a wonderful recovery when a good growth of clover appeared. One of the leading cows of the State broke down in the Standard Herd Test in 1923.

These instances pointed to a deficiency of some substance in the food. All the animals referred to were receiving food rich in protein and phosphorus, and the recovery of the cow in the case when legumes became plentiful seemed to clearly indicate that lime was the deficient substance.

When it is taken into consideration that the ordinary cow in her milk gives sufficient lime to build the bones of a fast-growing calf, and that many of the cows under test are giving double that quantity, it is easy to understand what a heavy demand for lime there must be on the body of a heavy-milking cow, and that if the food does not contain sufficient the body reserves must be drawn on till exhausted. The skeleton of the animal forms the storehouse for lime and other mineral matters, and when this supply is depleted a period of debility sets in, and the animal breaks down. The shortage of lime causes brittleness of bone, and it is this which is often responsible for many of the strange fractures that occur.

The feeding of concentrates, such as bran and grains containing an excess of phosphorus, causes larger quantities of lime to be thrown off in the excretions. Grass pastures will be deficient in lime and mineral matter during dry years owing to there not being sufficient moisture to allow the plant to assimilate it, and later animals will suffer from the lack of it.

In order to determine definitely whether a shortage of lime was the reason for sickness in a herd, experiments were some time since carried out with three or four of the cows (including one that had broken down while competing in the Standard Herd Test). The owner was anxious to have the experiment made, and helped to carry it out.

It was conducted on the following lines:—The cows were given about a desertspoonful of air-slaked lime twice daily, and there was an almost immediate improvement in the appetite. The owner said it became a pleasure to feed them. After three weeks they showed a slight tendency to scour; the dry lime was then discontinued, and the food moistened with limewater. They were given access to a tub of limewater from which they drank eagerly for the first few months, and then only at intervals. Towards the end of the period they were again given air-

slaked lime with their food—about a desertspoonful a day. The result was highly satisfactory, and the former contestant in the Herd Test yielded over 690 lb. butterfat.

Lime is now being used by several breeders in the Standard Herd Test, and up to the present most of them are well satisfied with the results.

The following foods are rich in lime:—Clover, vetches, lucerne, and pea meal, while bran and oats are rich in phosphorus, but comparatively low in lime contents. Bone-meal is rich in both lime and phosphorus. Whenever clovers are not plentiful in the paddocks, lucerne or clover chaff should be fed in the bails. If cattle are kept well supplied with legumes in hay, chaff, or pasture, as well as concentrates, there will be very little sickening and no breaking down. Lime can be placed in the water troughs. I would strongly advise breeders to have limewater available, so that the cows may drink it whenever they feel inclined. Experiments show that animals fed on food from which mineral matter has been almost entirely extracted die of mineral starvation, and it is very necessary to balance the mineral matter when feeding stock. In conclusion, I would like to emphasize the fact that food fed to cows should always be in a moist condition. I have seen many experiments, and the unvarying result has been an increase in milk when cows were fed on moistened rather than dry food. It would certainly be advantageous to moisten the food with limewater.

REFRIGERATION OF TO-DAY AS APPLIED TO FRUIT.*

By J. Hepburn, Chief Engineer and Manager, Government Cool Stores.

Owing to our highly civilized mode of existence and the tendency of the population to congregate in large cities, the marketing and distribution of foodstuffs has become a matter of complex organization.

Nature, at sharply defined periods, produces foodstuffs (some of which are highly perishable), and as often they may not all go into consumption at the time they are produced, means have to be employed to preserve them for weeks and months in a state suitable for human consumption.

To-day the best known medium for the preservation of perishable food in its natural state is refrigeration.

Considerable advance has been made during recent years in the application of this science, and we are fast approaching the time when definite information regarding the methods of cool storage and the temperatures which give consistently good results can be looked for.

Coming to fruit, with which this Conference is more directly concerned, the best results appear to be obtained when, on being taken from the tree, it is transferred as soon as possible to cool store, and its temperature reduced to storage temperature as rapidly as the method employed will allow.

* Paper read before the Fruitgrowers' Cool Stores Association, 2nd September, 1924.

The marketing life of fruit after leaving the cool store appears to be largely affected by the period elapsing between the removal of the fruit from the tree and its transference to the cool store, and the rate of cooling down to storage temperature.

Any system which allows of the extraction of large volumes of hot air and the introduction and rapid mixing of cool air to take its place will be the best for the treatment of fruit. Fierce or very rapid currents of air are undesirable, and the change from high to storage temperature should follow as closely as possible the natural law of the displacement of the hot and therefore lighter air by the incoming cool and heavier air.

The rate of cooling is to a large extent dependent on the method employed, and the more rapid that rate can be made without injury, the longer will be the life of the fruit after leaving the store.

It is not sufficient to lower the temperature of the chamber; the temperature of the fruit itself must be reduced. If on stoppage of the plant any noticeable rise in temperature takes place, it may be assumed (provided the insulation is in fair order) that all the heat has not been extracted from the fruit. It is advisable to run until this has been effected.

In cool stores ashore damage by high concentrations of carbon-dioxide has not been so pronounced as on board ship. This is probably due in a large measure to accidental ventilation by the opening of doors in the ordinary course of business. Nevertheless, it would appear advisable to have instruments to measure the atmospheric conditions in the chambers, both as to carbon-dioxide and humidity. I understand that a firm is now considering the manufacture of such instruments for commercial purposes.

Regarding humidity, from practical experience it can be said that this does not seem to be a fixed quantity, but is governed largely by the nature of the season. Also, fruit just received may require a different humidity from fruit which has been in store for some time. This is a matter on which more information is desirable.

The matter of the carriage of our fruit overseas brings up the much-debated and vexed question of pre-cooling. To my mind, this question might well be left to solve itself. Treatment of portion of the crop appears necessary at present, owing to the period that elapses between picking and shipment. However, the first essential seems to be the proper equipment on the ships which carry fruit, and recognition by the shipping companies of their responsibility* to land cargoes in sound condition. Once this is obtained, the matter of pre-cooling will probably be decided by the demand of the shipping companies for fruit which can be shipped with the smallest loss, in spite of all arguments for and against.

One point seems to stand out: The loading of both cooled and uncooled fruit into the same hold is inviting disaster, as the cooled portion acts as a cooling agent to the rest, in the same manner as ice would, and consequently the cooled portion shows poor condition when unloaded.

Practically no attention has been given to equipping of cool chambers on ships for the proper carriage of large fruit cargoes. In practically all of these the distribution of large volumes of cool air is impossible, and the taking of temperatures is haphazard. The present system should

be improved by the installation of long-distance thermometers, with the points suitably fixed in the holds to give the average temperature. This is even more desirable on the ship than ashore. Instruments should also be installed to indicate the gases present in the holds and the humidity.

Certain boats regularly carry fruit, and the proper equipment of them is a matter calling for immediate attention.

With the knowledge now available from scientific investigation, a definite chart of instructions could be drawn up, and if these were adhered to in properly-equipped vessels, there is little doubt that cargoes of fruit could be landed in good condition.

Ships loading at our ports have difficult conditions to meet, in that their hatches have to be off several times before their holds are filled. This fact is sometimes advanced as a reason for the deterioration of cargoes, but it is open to question. And it must not be overlooked that the occasional opening of the hold has one good effect. It permits a change of air in the hold, and if the pack has been refrigerated down to the proper temperature, and fresh loading is carried out expeditiously, probably no material damage is caused.

A chart of instructions on something like the following lines appears to be desirable:—

1. Cases to be stowed in such a way that circulation of air is possible.
2. Once the hatches are on, temperature to be reduced to a given degree within a given number of hours; this to be effected notwithstanding that further loading may possibly have to take place.
3. When final loading has been completed, and hatches on, temperature to be again reduced within a specified time, and to remain constant at a given temperature until the fruit is unloaded.
4. Humidity of hold to be maintained at a given figure after final loading.
5. Gas composition of hold to be maintained at a given ratio.

If rules such as are suggested above be adhered to, and the results be still unsatisfactory, it will be a simple matter to locate the fault and correct it. Variations in method will ultimately indicate the one best suited to requirements, and in time all shipments should be landed in good condition.

Consistently good results are one of the main features in establishing a firm and reliable market, and, further, they will bring about an appreciable reduction in insurance rates.

RHUBARB CULTURE.

Rhubarb may be said to grow anywhere, but the roots are averse to undrained soils, therefore sour soils should be avoided when contemplating the cultivation of this crop on commercial lines. A rich, friable loam should be selected when possible, but good yields are obtained with ordinary care from heavy, dark soils, as well as light, red, and sandy soils. Good drainage is essential, as the fleshy roots of the plants do

not tolerate any excess of moisture. Many instances are on record where whole fields have been "drowned out" during a period of abnormal summer rainfall. The dormant crowns would also decay where winter rainfall is experienced should they be subjected to stagnant water due to faulty drainage. Under any circumstances, marshy, or even damp, ground would call for much labour and expense to make it fit for rhubarb.

Soil Preparation.—There is always a tendency to get over this most important phase of cultivation in the least possible time; but rhubarb is not an annual crop with a shallow root system—it persists, and should not be disturbed, except for manuring and keeping clear of weeds, for six to eight years. The land should therefore be heavily dressed with well-rotted stable manure before cultivating; cultivate as deeply as possible; harrow thoroughly, and if the land has been dirty, grow a smother crop, such as field-peas or velvet beans, to plough under for humus; plant rhubarb the next year. If fairly clean, give a cross working, another harrowing, and form ridges for the crowns by throwing four furrows together (a hill-side plough will be found very useful for this purpose). This work may be done at a time suitable to the grower, and according to the rainfall, unless plenty of water is available for irrigation. The main idea is to have rich, deep, well-drained, and fairly clean land.

Raising from Seed.—This is a fairly slow process, and is not recommended where only a few hundred plants are required. The seed-beds, 4 feet wide and any convenient working length, must be well dug over or trenched to enable the young tapering roots to get down. In order to secure good drainage, the seed-beds should be raised 6 to 8 inches above the level of the surrounding soil, as the young plants are liable to damp off during wet weather. The soil should be rich from earlier manuring. Sow seed any time from August to October in drills 12 inches apart, to facilitate weeding and thinning out from time to time. Drop the seeds thinly, and cover with about ½ inch of fine soil; give a good watering, and keep land well weeded. When the young plants are growing freely, they should be thinned out to 6 inches apart, with the soil kept shaded; then allow the plants to grow undisturbed, except for weeding, until required for planting in permanent quarters the following spring. To obtain sufficient plants to set out an acre, two to three pounds of seed should be sown: all do not germinate, and thinning accounts for many more.

Planting.—It is a mistake to plant too closely. Some of the varieties have a very spreading habit of growth, for which ample room must be allowed. The crown (roots) should be set 3 to 4 feet apart in the rows, and preferably not opposite one another, but alternately in the various rows; this allows more growing space. The crowns may be purchased from nurserymen or raised from seed. If planted 3 feet by 3 feet, 4,480 plants would be required per acre; at 4 feet by 4 feet the number would be 2,722. The top of the crown should be about 2 inches below the surface, further protected by a liberal covering of stubble manure.

Protection from Wind Necessary.—In some localities the large leaves of rhubarb plants are badly broken by wind, or cut to ribbons by sharp grit being blown against them; this, naturally, retards development, and tends to produce short sticks.

Handling the Crop.—This phase requires as much thought and care as the actual growing of the sticks. Length and colour are factors to be considered; growers are recommended to grade the sticks before tying them into bundles. Tie each bundle at the top and base, and arrange to display the greatest amount of colour. A simple packing contrivance can be made for holding the sticks for tying by fixing two inverted horseshoes on a board. The leaves are cut off close to the stalk. The bundle should be packed in crates lined with damp canvas and dispatched to market.

Varieties.—It would be impossible to select any variety as an outstanding one for length and colour, as a great deal depends upon the liberal treatment during the growing season. There are two types, i.e., summer and winter; of the former, Early Albert, Wilson's Ruby, Marriner's Crimson, and Myatt's Victoria are very productve, and of good length and colour. Topp's Winter or Crimson Winter are dormant during the summer months, and if the land where these varieties are grown is well cultivated, heavily manured, and thoroughly irrigated from March onwards, unlimited supplies of this delicious vegetable may be obtained throughout the winter and early spring. During the growing season, it is essential that all flower spikes be suppressed, as these absorb most of the nourishment, and prevent the production of leaves and stems. It is not advisable to persistently pull all the leaves from a crown, as this is a weakening process; with a little discretion the crowns will yield continuously.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux or lime sulphur spraying for the black spot of apples and pears, for scab and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a weak lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead. Even a dry dusting with lime or with ordinary soil will keep the slugs in check.

For cherry aphis, the trees should be sprayed at once with nicotine-sulphate.

Codling moth spraying, too, will be in evidence this month. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

Arsenate of lead may be mixed with nicotine sprays, or with Bordeaux mixture, without any detriment to either spray, if necessary.

The Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to 1½ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Journal of Agriculture*, November, 1923, page 659. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will. Provide salt-lick consisting of 20 lbs. bone meal or rock phosphate, 20 lbs. slacked lime, 20 lbs. salt, and ½ lb. sulphate of iron.

Pigs.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate per 100 lbs. live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Prepare for dipping. Ascertain exact contents of bath before mixing. Powder or paste dips have the most lasting effect, particularly where lice have been bad. Hold sheep in the bath not less than half a minute; if badly infested, longer. Submerge heads twice, but allow them to rise quickly—most deaths after dipping are due to gross carelessness in holding sheep under too long, the dip wash being taken in on to the lungs. Dip rams and full grown sheep first, while bath is full, lambs last. Yard sheep over night. Dip while empty, and avoid fouling the drainer. Commence early in the day, and allow sheep to dry before nightfall. Avoid travelling long distances to and from baths, and dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths; this increases a dead tip in hot areas.

It is unsafe, and against instructions, to use powder dips in increased strength. Sheep badly lice-infested should be dipped directly off shears, and again in six weeks' time. Sheep with over a reasonable amount of wool on should be dipped at less strength than given on instructions. Close, fine-wooled sheep particularly so.

When constructing new dips, remember moderate-sized ones are most economical, just as efficient, and can be more easily emptied as they become fouled, and if they are near water can be quickly filled.

Poultry.—Provide plenty of green food and shade. Watch for vermin; spray crevices of perches and houses with crude carbolic acid, 1 in 50. Keep water clean and cool, and out of the sun. One packet of Epsom salts should be given to thirty birds through the mash. Remove all male birds from the flock. Infertile eggs are preferable when pickling, or when placed in cool storage.

CULTIVATION.

Farm.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

Orchard.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, cherry aphis, pear and cherry slug, and peach aphis. Plant out citrus trees.

Vegetable Garden.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow French beans, peas, lettuce, cucumber, melon, &c., seeds.

Flower Garden.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out chrysanthemums. Liquid-manure herbaceous perennials. Sulphur-dust for rose mildew.

BEE-KEEPING.

In most districts, October is the principal swarming month; in late localities, particularly at the higher elevations, most of the swarming takes place in November. Where a honey flow is expected from Redgum or Yellow Box during December and January, it is not wise to make a further increase in the number of colonies by allowing after-swarms to come off and hiving separately, as the parent stock would be too much depleted of bees, and there would not be sufficient time for it to recover, or for the swarms to build up, before the honey flow is on, and much of it would therefore be lost.

After-swarms can best be prevented by hiving the first or prime swarm on the old stand and moving the colony from which it came to a new stand, at the same time destroying all the queen cells in it except one—the most perfect and forward one.

If no increase at all is desired, the parent colony may be left alongside the old stand on which the swarm was hived, but with the entrance facing in a different direction. When the young queen in the swarmed stock is laying, which will be in about three weeks, the hive may be gradually turned round till it faces the same way as the swarm, and, after removing the old queen from the swarm, the two stocks may be re-united, thus making a very strong colony with a young laying queen, in the best condition for storing honey and very unlikely to swarm again the same season.

The uniting of the two stocks is best done towards evening, by first giving both a little smoke between the combs and then alternating them for the time being, so that each comb from the swarm is between two of the old combs, the object being to thoroughly mix the bees. Two or three days after, the combs can be sorted; the best should be selected for the brood chamber and the others put in the upper story. Uniting should not be attempted till after the young queen is laying, otherwise there will be much fighting.

In localities where the colonies have come through the Winter very strong, there is likely to be much swarming wherever Cape Weed or some other pollen-yielding plant is plentiful, the duration of blooming and of swarming depending, of course, upon the weather.

When several days of bad weather follow the hiving of swarms, it may be advisable to feed sugar syrup (one part sugar to one part water) to keep up comb-building and brood-rearing, so as to have the greatest number possible of field bees in the hive during the honey flow later on. Honey should never be used for feeding bees, unless it comes from an apiary which has been absolutely free from disease for at least two years.

NATIONAL MUSEUM MELBOURNE

GROW MORE SUMMER FODDER!

Most Favorable Season for Sowing

SUDAN GRASS

The Wonderful Drought-Resistant Summer Fodder

Adaptable to all climates, and will grow on any soil. If sown early four cuts can be obtained per season. Cattle eat the grass readily, there being an immediate increase in the milk yield, and a decided fattening of sheep and cattle.

A Splendid Crop of Sudan Grass.

JAPANESE MILLET

Excellent for Fodder

Rapid Grower

Very Productive

This Millet is rich in milk-producing properties, and yields a much heavier crop than the grasses and clovers generally used. It comes early, and can be fed off in from 4 to 6 weeks after seeding.

POSTED FREE –Special Summer Fodder Circular

Full Descriptive List and Prices of all Fodders, &c., for present sowing.

Also **Our 1924 General Catalogue** (160 Pages). Send for Copies Now.

COW PEAS

Excellent Summer Fodder. Drought-Resistant. Great Soil Improver.

Enormously productive, both of vine and peas; of exceptional value for feeding pigs and cattle. **It makes poor lands rich—makes good land more productive.** As a means of adding humus to the soil it is easily the superior of any nitrogen-gathering legume. 8d. lb.; 70/- cwt.

SOY BEANS

Splendid Fodder for Stock. Excellent for Hay. Of great value for its Fertilizing Properties.

In the warmer districts, with irrigation, gives wonderful results. It is not only a soil improver, gathering most of its nitrogen requirements from the air, but it furnishes a protein rich forage for hay or silage, or a concentrated feed in the form of the threshed beans. 1/- lb.; 50/- bushel.

SORGHUMS

Saccaline (or Sweet Sorghum)

Sweet and Palatable; Excellent for dairy cows, and a fine cleaning crop.

Sorghum Saccharatum

Its highly nutritious and Saccharine qualities recommend its culture to a much larger extent.

Imphee (Planter's Friend)

Extremely valuable as a late fodder. It gives a large body of feed in late Autumn.

Early Amber Cane

Very nutritious, milk-producing, and fattening. Extremely early.

LAW, SOMNER Pty. Ltd.

Established over 74 Years

Seed Merchants and Nurserymen

Block Place & Swanston St., Melbourne

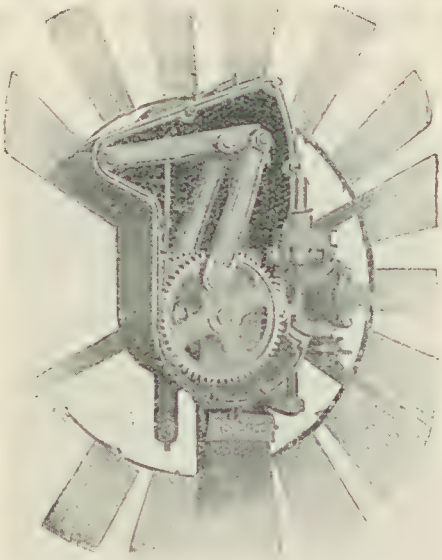
The leading Agricultural Seed House in Victoria

Australia's Great Achievement

RAIN PROOF

DUST PROOF

LEAK PROOF



ONE OILING LASTS A WHOLE YEAR

The New Enclosed-Gear

"Billabong" Windmill

is a great Windmill Engineering achievement, which gives to the man on the land a most reliable pumping plant in which the first cost will be about the only outlay needed. In the New Enclosed-Gear "BILLABONG" weather influences cannot affect the working parts, and with its unsurpassed oiling system, friction and wear and tear is practically nil.

The New "BILLABONG" is undoubtedly a very superior Windmill.

Full Particulars and Prices Post Free.

JOHN DANKS & SON PTY. LTD.

DANKS

391-403 BOURKE ST. MELB.

324-330 Pitt St., Sydney

THE STATE SAVINGS BANK OF VICTORIA

CREDIT FONCIER LOANS

ON FARMS—

Up to two-thirds of valuation in sums from £50 to £2,000, repayable by instalments spread over a period of 26½ years. Interest 6½ per cent. per annum.

Special Terms for Discharged Soldiers and Dependants, also those who were in **Red Cross** and **Transport Services,** up to three-fourths of valuation, repayable by instalments spread over a period of 29 years. Interest 6¼ per cent.

NO CHARGE FOR MORTGAGE DEED

Application forms obtainable at any Branch of the State Savings Bank.

State Savings Bank,
Head Office—Elizabeth Street, Melbourne

GEO. E. EMERY,
General Manager.

PARSONS BROS. & CO.

Propy. Ltd.

OATMEAL, SPLIT PEAS, and
PEARL BARLEY MILLERS
and "CORNINA" MANUFACTURERS

—ARE—

BUYERS of OATS, PEAS, BARLEY, and MAIZE.

SEND SAMPLES OF YOUR GRAIN TO US.

BOX 2514.
G.P.O., MELBOURNE.

FARMERS and GRAZIERS

The application of a heavier dressing of Superphosphate will produce

MORE WHEAT.

The top-dressing of your pasture means

MORE WOOL,

MORE MILK, and HEALTHIER STOCK.

ADDRESS YOUR INQUIRIES TO—

WISCHER & CO. PTY. LTD.

Manufacturers of Superphosphate, and Special Fertilizers for all Crops.

OFFICES:
153 William St., MELBOURNE.

WORKS:
Whitehall St., YARRAVILLE.

Farmers! Use

"ANTI-BUNT"

(Copper Carbonate)

A preventive against Bunt or Smut in Wheat and Oats.

ANTI-BUNT is manufactured in powdered form and is preferable to dipping, for the following reasons:—

1. It saves time and labour.
2. The seed can be treated any time before planting, and it is not necessary to use great care in disinfecting seed containers.
3. The seed does not become wet, so there is no danger of the seed heating or sprouting if it is necessary to keep it for some time after treating. The drill does not have to be set for swollen grain.
4. Anti-Bunt does not injure the seed as liquid preparations often do.
5. Anti-Bunt has a tendency to stimulate seed germinations, and thus increases yield.

For further particulars write to:—

A. VICTOR LEGGO & CO.

MELBOURNE: 497 Collins Street.
SYDNEY: 7 Hamilton Street.
BRISBANE: Market Street.

Manufacturers of "Vallo" Brand Arsenical preparations, and other chemicals.

AGENTS THROUGHOUT AUSTRALIA.

FRIGIDAIRE

The Automatic Electric Refrigerator

A Complete Ice Supply

—Economical and entirely automatic —— for use in the Country Home ——

FOR cafes, hotels, stations, and country homes Frigidaire comes as a boon for which the need has been long felt. ¶ It offers you all the service of an ice-chest with many additional advantages exclusive to this wonderful utility. ¶ It is a complete refrigerating plant, entirely automatic, which, when once installed, needs no attention, even starting and stopping itself. So simple that any one can use it. ¶ It makes you independent of ice supply—a fact of interest to city people in many cases, as well as country dwellers. ¶ It makes its own ice in compact, easily used cube forms, maintains with precision the exact low temperature that not only cools foodstuffs, beverages, &c., but keeps them sweet and pure. With it you can have unusual summer delicacies and delightful dishes on the hottest day or night. Let us demonstrate the remarkable qualities of the Frigidaire—and show you how amazingly low is its cost.

The fact that it is a product of the famous Delco Light Company assures its dependability. There's a size to suit your exact need.

Write for Booklet J.A.F.

WARBURTON FRANKI

(MELBOURNE) LIMITED

380-82 Bourke St., Melbourne (opp. Danks)

'Phone C.8888 (4 lines)

DEPARTMENT OF AGRICULTURE, VICTORIA

FRIESIANS FOR SALE

(1) Bull Calf *ex* Dominion Hyacinth (374)

Dropped 29th August, 1923

Sire: **Victoria Songboy (359)** by Dominion Domino Dutch Boy (73 F.H.B.A.), *ex* Dominion Madrigal (371 F.H.B.A.).

Sire of Dam: **Oak de Kol 2nd Homestead Fobes** (imp. to N.Z. from America) (341 N.Z.F.H.B.).

Dam's Record for 273 days under Government Herd Test—
11,512 lb. Milk, 4·08 Test, 479 lb. Butter Fat.

For Full Lactation Period—
13,898 lb. Milk, 4·24 Test, 589 lb. Butter Fat.

(2) Bull Calf *ex* Victoria Oakdale Lassie (996)

Dropped 24th September, 1923

Sire: **Victoria Jo Patch (345)** by Longbeach Big Patch (515 N.Z.F.H.B.), *ex* Dominion Madrigal (371).

Sire of Dam: **Dominion Oakdale (342)** by Oak de Kol 2nd Homestead Fobes.

Vict. Oakdale Lassie is now undergoing her 1st test.

Her Dam, Dominion Proud Lassie's Record for 273 days under Government Herd Test—
11,336 lb. Milk, 3·42 Test, 387 lb. Butter Fat.

For Full Lactation Period—
12,216 lb. Milk, 3·51 Test, 428 lb. Butter Fat.

(3) Bull Calf *ex* Dominion Woodnymph (988)

Dropped November, 1923

Sire: **Victoria Jo Patch (345)** by Longbeach Big Patch (515 N.Z.F.H.B.), *ex* Dominion Madrigal (371).

Sire of Dam: **Woodcrest Jo** (imp. to N.Z. from America) (334 N.Z.F.H.B.).

Dam's Record for 273 days under Government Herd Test—
10,610 lb. Milk, 3·17 Test, 336 lb. Butter Fat.

For Full Lactation Period—
13,240 lb. Milk, 3·31 Test, 439 lb. Butter Fat.

The record of the dam—DOMINION MADRIGAL—of the sires "Victoria Songboy" and "Victoria Jo Patch" for 273 days under Government Herd Test is 11,373 lb. Milk, 3·93 Test, 448 lb. Butter Fat; and for Full Lactation Period 13,485 lb. Milk, 4·17 Test, 563 lb. Butter Fat. "DOMINION MADRIGAL" is a full sister to "DOMINION QUEEN MERCEDES," third cow of all breeds under Government Herd Test 1923, and Winner "Weekly Times" Butter Competition, Melbourne Royal Show 1923, and Champion Melbourne Royal Show 1923.

(4) Cow "VICTORIA DUTCHMAID" - 5 years old
(Due to calve 10th June, 1925).
Sire: Dominion Domino Dutch Boy (73). *Dam:* Dominion Milkmaid (370).

(5) Cow "VICTORIA BELLONA" - - 5 years old
(Due to calve 3rd February, 1925).
Sire: Dominion Domino Dutch Boy (73). *Dam:* Dominion Belle Corona (369).

(6) Cow "VICTORIA CORIANDER" - - 5 years old
(Due to calve 15th April, 1925).
Sire: Dominion Domino Dutch Boy (73). *Dam:* Dominion Coringa (380).

Inspection of above Bull Calves and Heifers at the State Research Farm, Werribee, is invited.

Application for Purchase to—

DR. S. S. CAMERON, Director of Agriculture, MELBOURNE

A Proven Tractor

For the past eight years all over the world farmers have proved to their own satisfaction that "Cletrac" Tank Type Tractors will actually do more kinds of work more days in the year and over a greater variety of soil conditions, than any other Tractor.

A Safe Purchase

A Farmer cannot make a mistake in purchasing a "Cletrac." He is assured of putting his money into a tractor that will be always on the job, powerful and useful every day of the year, one that will do his work quicker, cheaper, easier and better.

CLETRAC IS IDEAL

for Plowing, Harrowing, Seeding, Harvesting, Tank Cleaning, Sawing, Grubbing, Grinding Feed, Hauling, Pumping, and a hundred and one other jobs on the Farm.

Literature Post Free with pleasure from—

TRACTION AUSTRALIA PTY. LTD.

469-71 Flinders Street, Melbourne

383 Sussex Street, Sydney

BARK

Consign your Bark to

S. P. REYNOLDS & CO.

Bark Merchants and Tanners

MACAULAY ROAD, NORTH MELBOURNE

HIGHEST PRICES PAID FOR

BEST BLACK & GOLDEN WATTLE

Consign direct to "Reynolds" Goldsbrough Mort's Siding, Macaulay

DEPARTMENT OF AGRICULTURE

POULTRY FOR SETTLERS

Orders for Cockerels for delivery from March may now be booked from the Poultry Pens at the Central Research Farm, Werribee
Settings of Eggs can be supplied in season
1st July to 1st October orders are booked in rotation

WHITE LEGHORNS

No. 1—Pure Cosh World's Record Strain.

„ 2—From Single Tested Hens with scores of 260 to 285 eggs, Single Mated to Cocks bred from Hens with scores of 275 to 301 eggs.

UTILITY BLACK ORPINGTONS

(Founded on Christie and Cullen Strains)

No. 1—From Single Tested Hens with scores of 256 to 284 mated to Cockerels bred from Hens with scores of 272 to 313 eggs.

„ 2—From Hens bred from above mated to Cockerels bred from Single Matings.

RHODE ISLAND REDS

Pure Dalrymple

From Hens with scores of 250 to 275 eggs, mated to Cockerels bred from Hens with scores of 264 to 292 eggs in 12 months.

For prices and particulars apply to The Manager, Research Farm, Werribee

"WHITE" TRUCKS

The Most Economical Means of Transport Offering To-Day

Models from ¾ to 5-tons to suit all needs

OFFERING UNAPPROACHABLE VALUE to the AGRICULTURALIST

FOR

TRUCKING

WOOL GRAIN
TIMBER FRUIT
MILK

AND ALL OTHER PRODUCE

AND FOR GENERAL FARM AND STATION WORK

The "WHITE" TRUCK has always been sold on **Performance**—Not **Price.**

The Policy Behind **The "WHITE" TRUCK** is **Economy** and **Service.**

A Truck Capable of Doing the **Most Work** for the **Least Money.**

EFFICIENT TRANSPORTATION AT LOW COST

Submit your transportation problems to us and we will help you to solve them.

Deferred Payments Arranged at only 7% Interest.

DALGETY & CO. LTD., Church St., MELBOURNE

YATES RE-CLEANED AND TESTED SEEDS

IMPORTANT LINES
FOR PRESENT SOWING

With the advent of the warmer weather the question of Summer and Autumn Fodder Crops requires prompt consideration.

Our 48 page Book of Fodder Crops contains much interesting information. Write for a copy.

The following are the lines of most importance for present planting:

SUDAN GRASS
The wonder crop for grazing, hay, or silage.

SEED MAIZE
Selected and specially re-graded samples of all the best green fodder and grain varieties.

SOY BEANS
A summer legume of great value in districts rather too cold for Cow Peas.

COW PEAS
For green soiling pasture, hay, or ensilage in warm districts.

SORGHUM
The dairyman's standby. All the best varieties.

GRAIN SORGHUMS
The summer growing grain crop for inland farmers.

MILLETS
Quick, cheaply grown Summer Fodder Crops.

SUNFLOWER
Grown for seed, and also makes valuable ensilage.

YATES CURRENT PRICE LIST OF FARM SEEDS CONTAINS ALL PRICES, AND IS POSTED PROMPTLY ON APPLICATION

ARTHUR YATES & CO. LIMITED

Letters G.P.O., Box 2707

Australia's Leading Seed House
SUSSEX ST., SYDNEY, N.S.W.

Wires "SEEDSMAN," SYDNEY

By Authority: H. J. Green, Government Printer, Melbourne.

You, as a Farmer

need cheaper production—

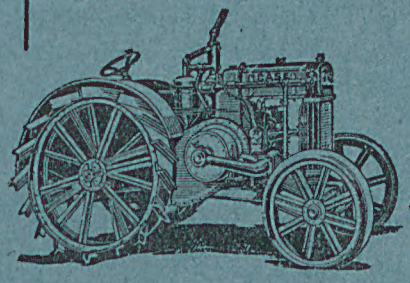
investigate the

CASE

Kerosene Farm & General Purpose Tractor

THERE is no doubt that the CASE Kerosene Tractor in all operations—Fallowing, Cultivating, Seeding, Harvesting, Hauling and Belt Work—reduces costs. It works at small expense and can keep on going while there is work to do, thus taking full advantage of all favorable weather conditions. With all implements the CASE is a one man job.

The CASE Tractor has many superior features, because it is built specially for the job. Let us tell you more about it. Write us for Catalogue and Booklet of Testimonials.



CASE Tractors are made in four sizes; there is one to meet your requirements

Sole Australian Agents:

Commonwealth Agricultural Service Engineers Ltd.

Head Office: Adelaide, S.A.

Melbourne Address: Corner KING and FLINDERS STREETS

Box 2049, G.P.O. 'Phone, Central 2124.

See AUSTRALIA FIRST!

Travel in Comfort by Train

Start with VICTORIA

Visit

FLINDERS INVERLOCH

—OR—

COWES

which are seaside resorts attracting many visitors. :: During the season through tickets are issued by the Victorian Railways

FLINDERS is reached by rail to Bittern and a car run of 15 miles—The fine Golf Links make this resort a favourite with Golfers.

INVERLOCH is a 9-mile car run from Wonthaggi, and has a fine sandy beach. The fishing is good, and boating and swimming can be safely enjoyed.

COWES is a delightful resort on Phillip Island, where a pleasant holiday can be spent at all times of the year. The seaside attractions are good, and the excursions that may be undertaken are full of charm and interest.
The steamer "Genista" carries passengers across from the rail terminus at Stony Point.

Before arranging your holiday, write, telephone or call upon the **Government Tourist Bureau, Queen's Walk, opposite Town Hall, Melbourne,** and the experts there will furnish you with particulars of these resorts, how to get to them, and the transportation cost.

'Phone Central 2898 (4 lines)

SP 630-S